**3GPP TSG-RAN WG4 Meeting # 99-e R4-210XXXX**

**Electronic Meeting, 19th – 27th May 2021**

**Agenda item:** 9.8.5

**Source:** Moderator (Samsung)

**Title:** Email discussion summary for [99-e][329] 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).

Based on the agreement captured in WF [R4-2106102], the feasibility study of supported maximum speed from demodulation perspective was analysed. Meanwhile, the test scope of UE/BS demodulation was under discussion. For this meeting, companies are encouraged to further discuss the test scope for UE/BS demodulation based on the FR2 HST deployment scenarios, and the related test setup for each identified requirements

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

* 9.8.5.1 General
* 9.8.5.2 UE demodulation requirements
* 9.8.5.3 BS demodulation requirements

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

* 1st round: Further discussion the test scope of UE/BS demodulation based on FR2 HST deployment scenarios and the related test setup for each requirements
* 2nd round: Based on the output of 1st round, try to agree the simulation assumption for each demodulation requirements as much as possible for alignment in future meeting.

# Topic #1: UE demodulation requirement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2109216 | Intel | Observation 1: When UE is served by one RRH the Doppler frequency trajectory is continuous and there are no problems to track it by TRS  Observation 2: To perform switching from one RRH to another UE needs to handle frequency jump which is different for different deployments scenarios. For unidirectional it can be up to max Doppler frequency and in bidirectional up to double max Doppler frequency  Proposal 1: Do not pursue agreement on baseline reference signal for DL frequency tracking.  Proposal 2: Consider one or two additional DMRS symbol for requirements definition (i.e. 1+1 or 1+1+1 configuration)  Proposal 3: Consider 200 MHz BW for DL HST FR2 requirements definition.  Proposal 4: Do not consider UE frequency error in demodulation test cases. |
| R4-2109749 | ZTE | Proposal 2 : It is feasible to use SSB+TRS for frequency offset tracking to support 350km/h  Proposal 3 : TRS or SSB period < 40ms  Proposal 4: one DMRS is enough to demodulation requirement for PDSCH based on Proposal 3. |
| R4-2109750 | ZTE | Proposal 1: Consider output of FR2 HST Deployment scenarios discussion whether to cover scenario A  Proposal 2: DPS scheme 1a could be considered in Uni-directional scenario.  Proposal 3: If another panel cannot be used for beam search, scheme 1a could be considered in Bi-directional scenario. If another panel can be used for beam search, both scheme 1a and 1b could be considered in Bi-directional scenario.  Proposal 4: 120KHz with 200MHz. |
| R4-2109805 | Samsung | Proposal 1: No PDSCH requirement with HST single tap channel model in FR2  Proposal 2: Define PDSCH requirement with Uni/Bi-directional scenario for both A and B. Define the test applicability rule to reduce the test effort. |
| R4-2109807 | Samsung | Proposal 1: Define PDSCH requirement with Doppler shift as 9722Hz with targeting 350km/h UE speed for both Uni-directional and Bi-directional RRH deployment scenarios, the assumption of RS frequency tracking method is up to UE implementation  Proposal 2: FFS to define PDSCH requirement with low Doppler shift as 7222Hz with targeting 260 km/h speed for Bi-directional RRH deployment scenario  Proposal 3: Define PDSCH requirement with DPS scheme 1a in Uni-directional scenario in scenario A. FFS scheme 1b.  Proposal 4: Define PDSCH requirement with DPS scheme 1a and 1b in Uni-directional scenario in scenario B, FFS the number of TCI state configured  Proposal 5: Define PDSCH requirement with DPS scheme 1a in Bi-directional scenario in scenario A and scenario B. FFS scheme 1b.  Proposal 6: Define PDSCH requirement with 1+1+1 DMRS configuration  Proposal 7: Define PDSCH requirement with 120KHz SCS 100MHz CBW |
| R4-2110531 | Huawei, HiSilicon | Observation 1: There is no any feasibility issue for DPS transmission scheme 1b for both Bi-directional and Uni-directional deployment.  Proposal 1: Define requirements for both scenario A/B and Uni/bi-directional deployment, and not define any applicability rule between them.  Proposal 2: Define both DPS transmission scheme 1a and 1b for both Bi-directional and Uni-directional deployment.  Proposal 3: Use 200MHz for PDSCH tests under FR2 HST scenario.  Proposal 4: Do not consider extra UE frequency error for FR2 HST.  Proposal 5: Assume static UE and single Probe. Combine RRM and Demod requirements as a single feature to support HST FR2 operation |
| R4-2110532 | Huawei, HiSilicon | Propose 1: To support 350km/h, RAN4 define performance requirements using TRS+SSB for tracking frequency offset for downlink.  Propose 2: Use DMRS 1+1+1 for FR2 HST PDSCH performance requirements definition. |
| R4-2110643 | Ericsson | Observation 1: Maximum Doppler frequency based on TRS is 14,000Hz if we don’t assume frequency error.  Observation 2: Maximum Doppler frequency based on TRS is 11,000Hz if we assume frequency error of 0.1ppm at 30GHz.  Proposal 1: Assume SSB+TRS as the baseline of frequency offset tracking to support 350km/h​.  Proposal 2: Assume DMRS configuration with 1+1+1 for UE demodulation requirements in HST FR2.  Proposal 3: Assume DMRS configuration without additional DMRS symbols for HST single tap scenario.  Proposal 4: RAN4 define two test cases for HST FR2.  Test 1: HST single tap (Uni-directional) with Scenario A  Test 2: DPS (Uni-directional) with Scenario B  If RAN4 agree to consider both Uni-directional and bi-directional deployment, either test 1 or 2 apply bi-directional model.  Proposal 5: For DPS scenario, RAN4 define both scheme 1a and 1b if the performance is same, but define the same applicability rule as Rel-16 HST, i.e., if a UE declared supporting > 1 TCI states, the UE will pass scheme 1b and skipped scheme 1a test cases, and if a UE only support 1 TCI state, the UE need to pass scheme 1a and skip scheme 1b test cases.  Proposal 6: Configure CBW=100MHz with SCS=120kHz for UE demodulation requirements in HST FR2.  Proposal 7: Impact of UE frequency error should be included in companies’ impairment results when RAN4 sets the UE demodulation requirements for HST FR2 |
| R4-2110720 | Qualcomm | Observation 1: Assuming zero frequency error, the range of maximum Doppler frequency estimation based on TRS is 14kHz.  Observation 2: In a bidirectional deployment, if Fc=30GHz and the train speed is 350 Km/h, a UE using TRS processing for frequency offset tracking will experience a maximum Doppler shift larger than 19kHz when switching between RRHs pointed in opposite directions, outside of the TRS range and the impact on performance is potentially unbounded.  Observation 3: Using both SSB and TRS for UE Frequency Offset Tracking does not solve the problem of the maximum Doppler shift larger than TRS FO estimation range, if the first resource received at the UE after the switch to a new RRH is TRS and not SSB.  Observation 4: Combining different resources (with different spectral characteristics as in the case of SSB and TRS) for FOT requires a dedicated UE implementation.  Observation 5: Feasibility of supporting maximum speed of 350km/h in downlink using TRS (4 symbol interval) and SSB for frequency offset tracking under bi-directional RRH deployment, assumes an increased complexity in the UE implementation of FOT schemes compared to a baseline UE implementation.  Proposal 1: Define FR2 HST tests assuming TRS for frequency offset estimations only.  Proposal 2: To avoid increasing UE FOT complexity, FR2 HST Demodulation tests should assume UE velocity such that the maximum Doppler shift experienced by the UE when switching across RRHs does not exceed the range of frequency offset estimation of TRS.  Proposal 3: Define Demodulation Tests assuming UE velocity of 350Km/h and Fc=30GHz for unidirectional deployment test only.  Proposal 4: For bidirectional deployment, define demodulation tests with lower UE speed to keep the maximum Doppler shift within the TRS range.  Observation 6: For real FR2 HST deployment, using 1 DMRS might impact performances if the channel is not single tap.  Observation 7: In existing FR1 HST tests, number of additional DMRS is 2.  Proposal 5: For the DMRS configuration for PDSCH demodulation requirement, support Option 2: (1+1+1) DMRS. |

## Open issues summary

Last RAN4 meeting agreements in the WF R4-2106102

List of open issues

* Sub-Topic 1-1: General
  + Issue 1-1-1: RS configuration to enable 350km/h
  + Issue 1-1-2: Whether to introduce PDSCH requirement with low Doppler frequency in Bi-directional RRH deployment scenario
  + Issue 1-1-3: Whether to introduce PDSCH requirement with HST single tap channel
  + Issue 1-1-4: PDSCH requirement for Bi-directional/ Uni-directional scenario in scenario A and scenario B
  + Issue 1-1-5: UE frequency error assumption
* Sub-Topic 1-2: PUSCH requirement
  + Issue 1-2-1: DPS transmission scheme
  + Issue 1-2-2: DMRS configuration
  + Issue 1-2-3: BW
  + Issue 1-2-4: Test applicability rule for DPS Tx schemes if both scheme 1a and 1b are introduced

### Sub-topic 1-1 General

**Issue 1-1-1: RS configuration to enable 350km/h**

* Observations
  + Observation 1 (Intel)
    - When UE is served by one RRH the Doppler frequency trajectory is continuous and there are no problems to track it by TRS
    - To performance switching from one RRH to another UE needs to handle frequency jump which is different for different deployments scenarios. For unidirectional it can be up to max Doppler frequency and in bidirectional up to double max Doppler frequency
  + Observation 2 (Qualcomm)
    - Maximum Doppler frequency based on TRS is 14000Hz if we do not assume frequency error
    - Assuming zero frequency error, the range of maximum Doppler frequency estimation based on TRS is 14kHz
    - In a bidirectional deployment, if Fc=30GHz and the train speed is 350 Km/h, a UE using TRS processing for frequency offset tracking will experience a maximum Doppler shift larger than 19kHz when switching between RRHs pointed in opposite directions, outside of the TRS range and the impact on performance is potentially unbounded.
    - Using both SSB and TRS for UE Frequency Offset Tracking does not solve the problem of the maximum Doppler shift larger than TRS FO estimation range, if the first resource received at the UE after the switch to a new RRH is TRS and not SSB
    - Combining different resources (with different spectral characteristics as in the case of SSB and TRS) for FOT requires a dedicated UE implementation.
    - Feasibility of supporting maximum speed of 350km/h in downlink using TRS (4 symbol interval) and SSB for frequency offset tracking under bi-directional RRH deployment, assumes an increased complexity in the UE implementation of FOT schemes compared to a baseline UE implementation.
  + Observation 3 (Ericsson):
    - Maximum Doppler frequency based on TRS is 14000Hz if we do not assume frequency error
    - Maximum Doppler frequency based on TRS is 11,000Hz if we assume frequency error of 0.1ppm at 30GHz.
* Proposals
  + Option 1 (Samsung, Intel): Do not pursue agreement on baseline reference signal for DL frequency tracking. Assumption of RS for frequency offset tracking is up to UE implementation
  + Option 2 (Huawei, Ericsson, ZTE): Assume SSB +TRS as baseline of frequency offset tracking to support 350km/h
    - Option 2a (ZTE) : TRS or SSB period < 40ms
  + Option 3 (Qualcomm): Define FR2 HST test assuming TRS for frequency offset estimation only
    - To avoid increasing UE FOT complexity, FR2 HST Demodulation tests should assume UE velocity such that the maximum Doppler shift experienced by the UE when switching across RRHs does not exceed the range of frequency offset estimation of TRS.
    - Define Demodulation Tests assuming UE velocity of 350Km/h and Fc=30GHz for unidirectional deployment test only.
    - For bidirectional deployment, define demodulation tests with low UE speed to keep the maximum Doppler shift within the TRS range
* Recommended WF
  + Encourage feedback from companies

**Issue 1-1-2: Whether to introduce PDSCH requirement with low Doppler frequency in Bi-directional RRH deployment scenario**

* Proposals
  + Option 1 (Samsung): FFS to define PDSCH requirement with low Doppler frequency for Bi-directional RRH deployment scenario
  + Option 2 (Qualcomm): For bi-directional deployment, define demodulation tests with low UE speed to keep the maximum Doppler shift within the TRS range
* Recommended WF
  + Encourage feedback from companies

**Issue 1-1-3: Whether to introduce PDSCH requirement with HST single-tap channel**

* Proposals
  + Option 1 (Samsung): No PDSCH requirement with HST single tap channel model in FR2
  + Option 2 (Ericsson): Define HST single tap (Uni-directional) with scenario A
* Recommended WF
  + Encourage feedback from companies

**Issue 1-1-4: PDSCH requirement for Uni/Bi-directional scenario in scenario A and scenario B**

* Proposals
  + Option 1(Samsung): Define PDSCH requirement with Uni/Bi-directional scenario for both A and B, Define the test applicability rule to reduce the test effort
  + Option 2 (Huawei): Define requirements for both scenario A/B, and Uni/Bi-directional deployment, and not define any applicability between
  + Option 3 (ZTE): Consider output of FR2 HST deployment scenario discussion whether to cover scenario A
  + Option 4 (Ericsson): RAN4 define two test cases for HST FR2
    - Test 1: HST single tap (Uni-directional) with scenario A
    - Test 2: DPS (Uni-directional) with scenario B
    - If RAN4 agree to consider both Uni-directional and Bi-directional deployment, either test 1 or 2 apply Bi-directional model
* Recommended WF
  + Encourage feedback from companies

**Issue 1-1-5: UE frequency error assumption**

* Proposals
  + Option 1(Huawei, Intel): Do not consider extra UE frequency error for demodulation tests in FR2 HST WI
    - Option 1a(Ericsson): Impact of UE frequency error should be included in companies’ impairment results when RAN4 sets the UE demodulation requirement for HST FR2
* Recommended WF
  + Encourage feedback from companies

### Sub-topic 1-2 PDSCH

**Issue 1-2-1: DPS transmission scheme**

* Observations
  + Observation 1 (Huawei): There is no any feasibility issue for DPS transmission scheme 1b for both Bi-directional and Uni-directional Deployment
* Proposals
  + Option 1(Samsung):
    - Define PDSCH requirement with DPS scheme 1a in Uni-directional scenario for scenario A. FFS scheme 1b
    - Define PDSCH requirement with DPS scheme 1a and 1b in Uni-directional scenario for scenario B, FFS the number of TCI state configured
    - Define PDSCH requirement with DPS scheme 1a in Bi-directional scenario for scenario A and scenario B. FFS scheme 1b
  + Option 2 (Huawei): Define both DPS transmission scheme 1a and 1b for both Bi-directional and Uni-directional deployment
    - Option 2a (Ericsson): RAN4 define both scheme 1a and 1b if the performance is same, but define the same applicability rule as Rel-16 HST, i.e., if a UE declared supporting > 1 TCI states, the UE will pass scheme 1b and skipped scheme 1a test cases, and if a UE only support 1 TCI state, the UE need to pass scheme 1a and skip scheme 1b test cases.
  + Option 3 (ZTE):
    - DPS scheme 1a could be considered in Uni-directional RRH scenario
    - If another panel cannot be used for beam search, scheme 1a could be considered in Bi-directional scenario. If another panel can be used for beam search, both scheme 1a and 1b could be considered in Bi-directional scenario.
* Recommended WF
  + Encourage feedback from companies

**Issue 1-2-2: DMRS configuration**

* Observations
  + Observation 1 (Qualcomm):
    - For real FR2 HST deployment, using 1 DMRS might impact performances if the channel is not single tap.
    - In existing FR1 HST tests, number of additional DMRS is 2
* Proposals
  + Option 1(Samsung, Intel, Qualcomm, Huawei, Ericsson ): 1+1+1 DMRS configuration
  + Option 2 (Ericsson, ZTE): 1 DMRS
    - Option 2a (Ericsson): 1 DMRS for HST single-tap channel
* Recommended WF
  + Define PDSCH requirement with 1+1+1 DMRS configuration based on DPS Tx scheme for FR2 HST WI?
  + Encourage company to check whether HST single-tap channel similar as FR1 is valid for FR2?

**Issue 1-2-3: BW**

* Proposals
  + Option 1(Samsung, Ericsson): 100MHz CBW
  + Option 2 (Huawei, Intel, ZTE): 200 MHz CBW
* Recommended WF
  + Encourage feedback from companies

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 1-1-1  Issue 1-1-2  Issue 1-1-3  Issue 1-1-4  Issue 1-1-5 |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 1-2-1  Issue 1-2-2  Issue 1-2-3  Issue 1-2-4 |

### 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 |
|  |
| YYY | Company A |
| 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”.*

# Topic #2: BS demodualtion requirement

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2109217 | Intel | Proposal 1: Consider 200 MHz BW for UL HST FR2 requirements definition.  Proposal 2: Consider PUSCH allocation length as 10 for HST FR2 requirements definition.  Proposal 3: Define PUSCH requirements with MCS 16 and MCS 17. Define requirements with MCS 17 up to BS declaration support.  Proposal 4: Consider Ncs equals to 69 for PRACH HST FR2 requirements definition. |
| R4-2109749 | ZTE | Proposal 1: one DMRS is enough to demodulation requirement for PUSCH. |
| R4-2109805 | Samsung | Proposal 3: Define PUSCH requirement with uni-directional RRH deployment scenario only in scenario A. If both scenarios are introduced for PUSCH requirements, define the test applicability rule to reduce the test effort with only one of them will be selected for testing based on manufacture of declaration.  Observation 1: For served RRH k, Doppler shift trajectory in Bi-directional is divided with two non-contiguous segments  Observation 2: For served RRH k, Doppler shift trajectory in Bi-directional is divided with three non-contiguous segments  Observation 3: The performance in Bi-directional scenario for each Doppler shift trajectory segments can be verified by the single-tap performance in Uni-directional scenario  Proposal 4: FFS to define the PUSCH requirement with non-contiguous Doppler shift trajectory, FFS on PUSCH Statistics method during the RRH switching time for requirement definition.  Proposal 5: If needed, define the PUSCH requirement with equivalent contiguous Doppler shift trajectory for bi-directional RRH deployment scenario with scenario A. If both scenarios A and B for bi-directional RRH deployment scenario are introduced for PUSCH requirements, define the test applicability rule to reduce the test effort with only one of them will be selected for testing based on manufacture of declaration. |
| R4-2109806 | Samsung | Observation 1: The overhead of 1DMRS +PTRS (L=1, K=2) configuration is the smallest compared with other RS configuration schemes.  Observation 2: Similar performance can be achieved for both bi-directional and un-directional deployment scenario in scenario A  Observation 3: Similar performance can be achieved for un-directional scenario in scenario A and B  Observation 4: Better performance can be achieved for bi-directional scenario in scenario B  Observation 5: With 1 DMRS+PTRS (L=1, K=2) configuration, better performance can be achieved in terms of maximum throughput compared with other RS configurations.  Proposal 1: Define PUSCH demodulation requirement with only 1 DMRS + PT-RS (L=1, K=2) configuration  Proposal 2: For 120 KHz SCS, it is feasible to define PUSCH requirement with Doppler frequency as 19444Hz. FFS to define low Doppler frequency 14444Hz requirement based on target 260km/h.  Proposal 3: Define PUSCH requirement with 120 KHz SCS and 100 MHz CBW, FFS with 50MHz CBW  Proposal 4: Define one set of MCS for PUSCH requirement, MCS 16 can be regarded as starting point. Additional margin can be considered for performance requirement definition to allow different implementation if needed  Proposal 5: Define PUSCH requirement with length of data symbol as 9  Proposal 6: The following simulation assumption for PUSCH requirement with HST single tap setup can be considered as   |  |  |  | | --- | --- | --- | | Parameter | | Value | | Transform precoding | | Disabled | | Default TDD UL-DL pattern (Note 1) | | 120kHz SCS:  3D1S1U, S=10D:2G:2U | | HARQ | Maximum number of HARQ transmissions | 4 | | RV sequence | 0, 2, 3, 1 | | DM-RS | DM-RS configuration type | 1 | | DM-RS duration | single-symbol DM-RS | | Additional DM-RS symbols | pos0 | | Number of DM-RS CDM group(s) without data | 2 | | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB | | DM-RS port(s) | {0} | | DM-RS sequence generation | NID=0, nSCID =0 | | Time domain resource | PUSCH mapping type | B | | Start symbol index | 0 | | Allocation length | 9 | | Frequency domain resource | RB assignment | Full applicable test bandwidth | | Frequency hopping | Disabled | | TPMI index for 2Tx two-layer spatial multiplexing transmission | | 0 | | Code block group based PUSCH transmission | | Disabled | | PT-RS configuration | Frequency density (KPT-RS) | 2 | | Time density (LPT-RS) | 1 | | NOTE 1: The same requirements are applicable to TDD with different UL-DL patterns | | |   Proposal 7: Define UL timing adjustment requirement with only 1 DMRS + PT-RS (L=1, K=2) configuration  Proposal 8: Define UL timing adjustment requirement with MCS 16 as starting point  Proposal 9: Define UL timing adjustment requirement with CP-OFDM waveform  Proposal 10: Define UL timing adjustment requirement with 120 KHz SCS and 100 MHz CBW, FFS with 50MHz CBW  Proposal 11: Define UL timing adjustment requirement with the following RB allocation two UEs as  Moving UE: 0~32 for 100MHz CBW, FFS 0~15 for 50MHz  Stationary UE: 33-65 for 100 MHz CBW, FFS 16~32 for 50 MHz  Proposal 12: SRS bandwidth configuration is proposed as  C\_SRS = 11, B\_SRS =0, for 40RB with 120 KHz SCS and 100 MHz  FFS C\_SRS = 11, B\_SRS =0, for 20RB with 120 KHz SCS and 50 MHz  Transmission comb: KTC=2  Transmission periodicity: TSRS=10  Slots in which sounding RS is transmitted: The last symbol in slot#3 in radio frames  Proposal 13: The timing difference between moving UE and stationary UE should be scaled with  120 KHz SCS: Δτ - (TA −31)×16\*8Tc  Proposal 14: Set frequency offset as 19444Hz for PRACH format requirement to align the Doppler shift assumption of PUSCH  Proposal 15: Reuse the following test parameters for PRAH format requirement   |  |  |  | | --- | --- | --- | | PRACH | PRACH SCS | Time error tolerance | | preamble | (kHz) | AWGN | | C2 | 120 | 0.26us |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | PRACH preamble | SCS (kHz) | Ncs | Logical sequence index | v | | C2 | 120 | 69 | 0 | 0 | |  | |
| R4-2110530 | Huawei, HiSilicon | Proposal 1: Define requirements for both scenario A/B and uni/bi-directional deployment, and not define any applicability rule between them.  Proposal 2: Use 200MHz for PUSCH tests under FR2 HST scenario.  Proposal 3: Use 10 symbols for PUSCH tests under FR2 HST scenario.  Proposal 4: Use MCS 16 for HST FR2 PUSCH requirements definition.  Proposal 5: Align the Doppler value with PUSCH for PRACH tests.  Proposal 6: Using Ncs = 69 for PRACH tests for FR2 HST. |
| R4-2110532 | Huawei, HiSilicon | Observation 1: There is negligible performance difference between DMRS 1+1 and DMRS 1+1+1.  Observation 2: There is about 1.2dB performance degradation between DMRS 1 and the others due to large residual frequency offset using PTRS only for frequency offset estimation.  Proposal 1: Use 1+1+1 DMRS+PTRS (L=1, K=2) for HST FR2 PUSCH requirements definition.  Proposal 2: If companies have strong concern about DMRS 1+1, create an applicability rule that only one DMRS configuration shall be tested by manufacture declaration. |
| R4-2110730 | Ericsson | Observation 1: The performance difference is negligible for PUSCH configured with PT-RS +(1+0) DM-RS and PT-RS +(1+1) DM-RS symbols  Proposal 1: Assume (1+0) DM-RS +PT-RS configuration for PUSCH demodulation  Proposal 2: Define test cases for scenario A only  Proposal 3: Configure 100MHz CBW for PUSCH demodulation requirements  Proposal 4: Configure 10 PUSCH symbols for FR2 HST demodulation requirements  Proposal 5: Configure highest MCS that remains below 20dB SNR (i,e. MCS20) for PUSCH demodulation  Proposal 6: Align CBW and MCS for UL timing adjustment and PUSCH demodulation requirements  Proposal 7: Apply 19444Hz frequency offset for PRACH, which corresponds to 350km/h at 30GHz carrier.  Proposal 8: Use Ncs=0 for PRACH HST FR2.  Proposal 9: RAN4 to decide to use between a). Current timing offset configuration; and b). timing offset configuration based on the largest expected cell radius, i.e., derived from scenario B. |
| R4-2111067 | Nokia | **On the test scope**  Observation 1: The difference in SINR values corresponding to 30% and 70% of PUSCH maximum TPut with the same test configuration in Scenario A and Scenario B is less than 0.3 dB. Scenario B looks to be slightly less challenging because the same relative TPut levels can be achieved at a bit lower SINR.  Observation 2: In HST FR1 PUSCH requirements, the performance difference between Scenario 1 and Scenario 4 in HST propagation conditions are not significant. However, different sets of tests are defined for both scenarios.  Proposal 1: RAN4 to define different sets of requirements for Scenario A and Scenario B.  Observation 3: The difference in SINR values corresponding to 30% and 70% of PUSCH maximum TPut with the same test configuration in uni- and bi-directional deployments is less than 0.1 dB.  Observation 4: The uni-directional and bi-directional scenarios are fundamentally different from the Doppler trajectory point of view.  Proposal 2: RAN4 to consider formulating HST FR2 PUSCH requirements based only one single-tap propagation model with continuous Doppler trajectory, i.e., reuse existing FR1 high speed train conditions with updated parameters.  Proposal 3: If it is decided that single HST conditions are not sufficient for HST FR2, then to define both PUSCH demodulation requirements for uni- and bi-directional RRH deployment scenarios.  **On PUSCH requirements**  Observation 5: 50MHz CBW is the minimal supported BW in FR2. However, in practical deployments, a wider frequency allocation is expected to be used in FR2.  Proposal 4: RAN4 to define HST FR2 BS demodulation requirements with 120KHZ SCS and for 50MHz and 200MHz SCS.  Observation 6: Following Table 6.4.1.1.3-3 in TS 38.211, the density of DM-RS symbols is higher for PUSCH duration in symbols equal to 9 than for duration 10.  Proposal 5: RAN4 to define HST FR2 BS demodulation requirements with the PUSCH duration in symbols equal to 9.  Proposal 6: RAN4 to define HST FR2 BS demodulation requirements only with QAM16, i.e., MCS 16.  Proposal 7: RAN4 to formulate PUSCH demodulation requirements at least with one addition DM-RS symbol per slot.  Proposal 8: RAN4 to formulate PUSCH demodulation requirements with mapping type B, one additional DM-RS position = pos 1 and l0=0.  **On UL timing adjustment requirements**  Proposal 9: Update parameters for UL timing adjustment scenario Y by .  adding the following HST FR2 relevant records: A - 120 kHz: 1.25 s; 120 kHz: 1.04 s-1.  Proposal 10: Update test parameters for testing UL timing adjustment as shown in the Table above   |  |  |  | | --- | --- | --- | | Parameter | | Value | | Transform precoding | | Disabled | | Uplink-downlink allocation for TDD | | 15 kHz and 120 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U | | Channel bandwidth | | 15 kHz SCS: 5MHz, 10 MHz  30 kHz SCS: 10MHz, 40 MHz  120 kHz SCS: 200 MHz | | MCS | | 16 | | HARQ | Maximum number of HARQ transmissions | 4 | |  | RV sequence | 0, 2, 3, 1 | | DM-RS | DM-RS configuration type | 1 | |  | DM-RS duration | single-symbol DM-RS | |  | DM-RS position (*l0*) | FR1: 2  FR2: 0 | |  | Additional DM-RS position | FR1: pos2  [FR2: pos1] | |  | Number of DM-RS CDM group(s) without data | 2 | |  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB | |  | DM-RS port | {0} | | Time domain resource assignment | DM-RS sequence generation | NID0=0, nSCID =0 for moving UE  NID0=1, nSCID =1 for stationary UE | |  | PUSCH mapping type | FR1: Both A and B  FR2: B | |  | Allocation length | FR1: 14  [FR2: 9] | | Frequency domain resource assignment | RB assignment | 10MHz CBW: 25 RB for each UE  40MHz CBW: 50 RB for each UE  200MHz CBW: 66 RB for each UE | |  | Starting PRB index | Moving UE: 0  Stationary UE:  12 for 5MHz, 25 for 10 MHz CBW for SCS 15kHz,  12 for 10MHz, 50 for 40 MHz CBW for SCS 30kHz, and  66 for 120 SCS 120 KHz | |  | Frequency hopping | Disabled | | SRS resource allocation | Slots in which sounding RS is transmitted (Note 1) | For FDD: slot #1 in radio frames  For TDD:  - last symbol in slot #3 in radio frames for 15KHz and 120KHz  - last symbol in slot #7 in radio frames for 30KHz | |  | SRS resource allocation | 15 kHz SCS:  CSRS = 5, BSRS =0, for 20 RB  CSRS = 11, BSRS =0, for 40 RB  30 kHz SCS:  CSRS =5, BSRS =0, for 20 RB  CSRS = 21, BSRS =0, for 80 RB  120 kHz SCS:  CSRS = 33, BSRS =0 for 132 RB | | NOTE 1. The transmission of SRS is optional. And the transmission comb and SRS periodic are configured as KTC = 2, and TSRS = 10 respectively. | | |   Proposal 11: RAN4 to discuss if 50MHz CBW shall be added in the scope of UL timing adjustment requirements  **On PRAH requirements**  Proposal 12: RAN4 to discuss PRACH requirements with maximum Doppler shift corresponding to 30GHz CF at 250kmph, i.e,9722Hz  Observation 7: Ncs equal to 69 is the default value used for preamble format C2 in FR2 (120KHz SCS) PRACH requirements in normal mode.  Proposal 13: RAN4 to use Ncs=69 in HST FR2 PRACH test preamble configuration. |
| R4-2111108 | Nokia | Observation 1: There is no significant difference in the demodulation performance between the cases with only one and two DM-RS per slot when PT-RS is present. We can expect a similar behaviour when two additional DM-RS symbols are used.  Observation 2: It is practical to use at least one additional DM-RS symbol per slot in real implementation where fast fading is inevitably present. Moreover, in HST FR1 PUSCH requirements two additional DM-RS symbols are used.  Proposal 1: RAN4 to formulate PUSCH demodulation requirements at least with one addition DM-RS symbol per slot.  Proposal 2: RAN4 to formulate PUSCH demodulation requirements with mapping type B, one additional DM-RS position = pos 1 and l0=0. |

## Open issues summary

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

Last RAN4 meeting agreements in the WF R4-2106102

List of open issues

* Sub-Topic 2-1: General
  + Issue 2-1-1: Maximum Doppler frequency for specifying PUSCH requirement
  + Issue 2-1-2: Whether to introduce low Doppler frequency 14444Hz for PUSCH requirement
  + Issue 2-1-3: PUSCH requirement for Uni-directional and Bi-directional RRH deployment scenario
  + Issue 2-1-4: PUSCH requirement for scenario A and scenario B
* Sub-Topic 2-2: PUSCH requirement
  + Issue 2-2-1: RS configuration
  + Issue 2-2-2: CBW
  + Issue 2-2-3: MCS
  + Issue 2-2-4: Length of data symbol
* Sub-Topic 2-3: UL timing adjustment requirement
  + Issue 2-3-1: Waveform
  + Issue 2-3-2: CBW
  + Issue 2-3-3: PUSCH resource allocation
  + Issue 2-3-4: RS configuration
  + Issue 2-3-5: PUSCH mapping type
  + Issue 2-3-6: length of PUSCH allocation
  + Issue 2-3-7: MCS
  + Issue 2-3-8: SRS bandwidth configuration
  + Issue 2-3-9: SRS Transmission comb
  + Issue 2-3-10: SRS Transmission periodicity
  + Issue 2-3-11: Slots in which sounding RS is transmitted
  + Issue 2-3-12: Test Parameters for timing offset
  + Issue 2-3-13: Timing different between moving UE and stationary UE
* Sub-Topic 2-4: PRACH requirement
  + Issue 2-4-1: Frequency offset for requirement
  + Issue 2-4-2: Test Preamble configuration
  + Issue 2-4-3: Timing offset configuration
  + Issue 2-4-4: Test error tolerance

### Sub-topic 2-1 General

*Sub-topic description:*

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

**Issue 2-1-1: Maximum Doppler frequency for specifying PUSCH requirement**

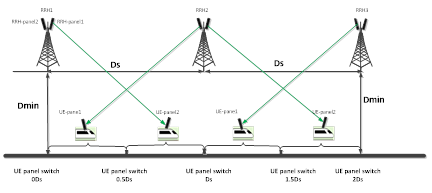
* Proposals
  + Option 1(Samsung): 19444Hz
* Recommended WF
  + RAN4 to introduce PUSCH requirement with Doppler frequency as 19444Hz targeting 350km/h at 30GHz?

**Issue 2-1-2: Whether to introduce low Doppler frequency 14444Hz for PUSCH requirement**

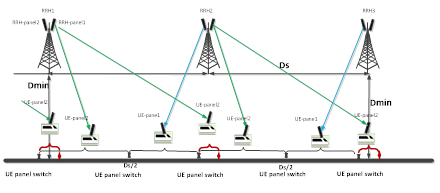
* Proposals
  + Option 1(Samsung): FFS to introduce PUSCH requirement with low Doppler frequency 14444Hz based on the targeting 260km/h UE speed at 30GHz carrier frequency
  + Option 2: No, only introduce PUSCH requirement with Doppler frequency 19444Hz
* Recommended WF
  + Encourage feedback from companies

**Issue 2-1-3: PUSCH requirement for Uni-directional and Bi-directional RRH deployment scenario**

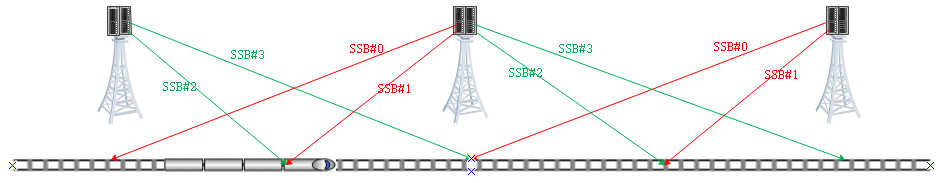
* Background
  + Schemes discussion in Bi-directional RRH scenarios in the last Meeting WF R4-, to solve the “RRH site” coverage issue
    - Scheme 1: connecting to 2nd -Nearest RRH

****

* + - Scheme 2: Connecting to Nearest RRH except the coverage hole

****

* + - Scheme 3: Connecting to Nearest RRH except the area under RRH



* Observations
  + Observation 1(Samsung):
    - For served RRH k, Doppler shift trajectory in Bi-directional is divided with two non-contiguous segments for scheme1
    - For served RRH k, Doppler shift trajectory in Bi-directional is divided with three non-contiguous segments for scheme2
    - The performance in Bi-directional scenario for each Doppler shift trajectory segments can be verified by the single-tap performance in Uni-directional scenario
  + Observation 2(Nokia):
    - The difference in SINR values corresponding to 30% and 70% of PUSCH maximum TPut with the same test configuration in Uni- and bi-directional deployments is less than 0.1 dB
    - The Uni-directional and bi-directional scenarios are fundamentally different from the Doppler trajectory point of view
* Proposals
  + Option 1 (Samsung):
    - FFS to define PUSCH requirement with non-contiguous shift trajectory, FFS on PUSCH statistic method during the RRH switching time for requirement definition if defined, in Bi-directional scenario
    - If needed, define the PUSCH requirement with equivalent contiguous Doppler shift trajectory for bi-directional RRH deployment scenario with scenario A.
    - If both scenarios A and B for bi-directional RRH deployment scenario are introduced for PUSCH requirements, define the test applicability rule to reduce the test effort with only one of them will be selected for testing based on manufacture of declaration
  + Option 2 (Nokia):
    - RAN4 to consider formulating HST FR2 PUSCH requirements based only one single-tap propagation model with continuous Doppler trajectory, i.e., reuse existing FR1 high speed train conditions with updated parameters
    - If it is decided that single HST conditions are not sufficient for HST FR2, then to define both PUSCH demodulation requirements for Uni- and bi-directional RRH deployment scenarios.
  + Option 3 (Huawei)
    - Define requirements for both scenario A/B and Uni/Bi-directional deployment, and not define any applicability rule between them.
* Recommended WF
  + Encourage feedback from companies

**Issue 2-1-4: PUSCH requirement for scenario A and scenario B**

* Observations
  + Observation 1(Samsung):
    - Similar performance can be achieved for both bi-directional and un-directional deployment scenario in scenario A
    - Similar performance can be achieved for Uni-directional scenario in scenario A and B
    - Better performance can be achieved for bi-directional scenario in scenario B compared with Uni-directional scenario
  + Observation 2 (Nokia):
    - The difference in SINR values corresponding to 30% and 70% of PUSCH maximum TPut with the same test configuration in Scenario A and Scenario B is less than 0.3 dB.
    - Scenario B looks to be slightly less challenging because the same relative TPut levels can be achieved at a bit lower SINR.
* Proposals
  + Option 1 (Samsung): Define PUSCH requirement with Uni-directional RRH deployment scenario only in scenario A. If both scenarios are introduced for PUSCH requirements, define the test applicability rule to reduce the test effort with only one of them will be selected for testing based on manufacture of declaration.
  + Option 2 (Nokia): RAN4 to define different sets of requirements for Scenario A and Scenario B
  + Option 3 (Ericsson): Define test cases for scenario A only
  + Option 4 (Huawei): Define requirements for both scenario A/B, and not define any applicability rule between them
* Recommended WF
  + Encourage feedback from companies

### Sub-topic 2-2 PUSCH requirement

*Sub-topic description:*

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

**Issue 2-2-1: RS configuration**

* Observations
  + Observation 1(Samsung):
    - The overhead of 1DMRS +PTRS (L=1, K=2) configuration is the smallest compared with other RS configuration schemes
    - With 1 DMRS+PTRS (L=1, K=2) configuration, better performance can be achieved in terms of maximum throughput compared with other RS configurations
  + Observation 2 (Ericsson):
    - The performance difference is negligible for PUSCH configured with PT-RS +(1+0) DM-RS and PT-RS + (1+1) DM-RS symbols
  + Observation 3 (Huawei):
    - There is negligible performance difference between DMRS 1+1 and DMRS 1+1+1.
    - There is about 1.2dB performance degradation between DMRS 1 and the others due to large residual frequency offset using PTRS only for frequency offset estimation.
  + Observation 4 (Nokia):
    - There is no significant difference in the demodulation performance between the cases with only one and two DM-RS per slot when PT-RS is present. We can expect a similar behaviour when two additional DM-RS symbols are used.
    - It is practical to use at least one additional DM-RS symbol per slot in real implementation where fast fading is inevitably present. Moreover, in HST FR1 PUSCH requirements two additional DM-RS symbols are used
* Proposals
  + Option 1(Samsung, Ericsson, ZTE): 1 DMRS+ PT-RS (L=1, K=2)
  + Option 2(Nokia): 2 DMRS +PT-RS (L=1, K=2)
  + Option 3(Huawei): 3 DRMS +PT-RS (L=1, K=2)
    - Option 3a: If companies have strong concern about DMRS 1+1, create an applicability rule that only one DMRS configuration shall be tested by manufacture declaration
* Recommended WF
  + Encourage feedback from companies

**Issue 2-2-2: CBW**

* Observations
  + Observation 1 (Nokia): 50MHz is the minimal supported BW in FR2. However, in practical deployments, a wider frequency allocation is expected to be used in FR2
* Proposals
  + Option 1(Samsung): 100 MHz CBW, FFS 50MHz CBW
  + Option 2(Intel, Huawei): 200 MHz CBW
  + Option 3(Ericsson): 100 MHz CBW
  + Option 4(Nokia): 50 MHz CBW and 200 MHz CBW
* Recommended WF
  + Encourage feedback from companies

**Issue 2-2-3: MCS**

* Proposals
  + Option 1(Samsung, Huawei, Nokia): only with MCS16
    - Option 1a(Samsung): Additional margin can be considered for performance requirement definition to allow different implementation if needed
  + Option 2(Intel): Both MCS 16 and MCS17
    - Define requirements with MCS17 up to BS declaration support
  + Option 3(Ericsson): Configure highest MCS that remains below 20dB SNR, i.e, MCS20
* Recommended WF
  + Encourage feedback from companies

**Issue 2-2-4: Length of data symbol**

* Observations
  + Observation 1(Nokia): Following Table 6.4.1.1.3-3 in TS 38.211, the density of DM-RS symbols is higher for PUSCH duration in symbols equal to 9 than for duration 10.
* Proposals
  + Option 1(Samsung, Nokia): 9
  + Option 2(Huawei, Ericsson, Intel): 10
* Recommended WF
  + Encourage feedback from companies

### Sub-topic 2-3 UL timing adjustment requirement

*Sub-topic description*

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

**Issue 2-3-1: Waveform**

* Proposals
  + Option 1(Samsung): CP-OFDM
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-2: CBW**

* Proposals
  + Option 1(Samsung): 100 MHz CBW, FFS 50 MHz CBW
  + Option 2(Ericsson): Align CBW for UL timing adjustment and PUSCH demodulation requirement
    - 100MHz CBW
  + Option 3(Huawei, Nokia): 200MHz CBW
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-3: PUSCH resource allocation**

* Proposals
  + Option 1(Samsung):
    - Moving UE: 0~32 for 100 MHz CBW, FFS 0~15 for 50 MHz CBW
    - Stationary UE: 33~65 for 100MHz CBW, FFS 16~31 for 50MHz CBW
  + Option 2 (Ericsson): Align CBW for UL timing adjustment and PUSCH demodulation requirement
    - Moving UE: 0~32 for 100 MHz CBW
    - Stationary UE: 33~65 for 100MHz CBW
  + Option 3 (Nokia, Huawei):
    - Moving UE: 0~65 for 200 MHz CBW
    - Stationary UE: 66~131 for 200MHz CBW
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-4: RS configuration**

* Proposals
  + Option 1(Samsung, Ericsson): 1 DMRS+ PTRS (L=1.K=2)
  + Option 2(Nokia): 2 DMRS +PTRS (L=1, K=2)
  + Option 3(Huawei): 3 DMRS +PTRS(L=1, K=2)
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-5: PUSCH mapping type**

* Proposals
  + Option 1(Nokia): Type B
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-6: length of PUSCH allocation**

* Proposals
  + Option 1(Nokia, Samsung): 9
  + Option 2(Huawei): 10
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-7: MCS**

* Proposals
  + Option 1(Samsung, Huawei, Nokia): MCS16
  + Option 2(Ericsson):Align MCS for UL timing adjustment and PUSCH demodulation requirement
    - Configure highest MCS that remains blow 20dB SNR, i.e., MCS20
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-8: SRS bandwidth configuration**

* Proposals
  + Option 1(Samsung):
    - C\_SRS =11, B\_SRS =0 for 40RB, with 100 MHz CBW
    - FFS C\_SRS = 5, B\_SRS=0 for 20RB, with 50 MHz CBW
  + Option 2(Huawei, Nokia): C\_SRS=33, B\_SRS=0 for 132RB with 200MHz CBW
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-9: SRS Transmission comb**

* Proposals
  + Option 1(Samsung, Nokia): KTC=2
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-10: SRS Transmission periodicity**

* Proposals
  + Option 1(Samsung, Nokia): TSRS=10
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-11: Slots in which sounding RS is transmitted**

* Proposals
  + Option 1(Samsung, Nokia, Huawei):
    - The last symbol in slot#3 in radio frames for 120KHz SCS
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-12: Test Parameters for timing offset**

* Proposals
  + Option 1(Nokia, Huawei):
    - A: 1.25us
    - 1.04 s-1
* Recommended WF
  + Encourage feedback from companies

**Issue 2-3-13: Timing different between moving UE and stationary UE**

* Proposals
  + Option 1(Samsung):
    - Δτ - (TA −31)×16\*8Tc
* Recommended WF
  + Encourage feedback from companies

### Sub-topic 2-4 PRACH requirement

*Sub-topic description*

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

**Issue 2-4-1: Frequency offset for requirement**

* Proposals
  + Option 1(Samsung, Huawei, Ericsson, Nokia): Set frequency offset as 19444Hz to align the Doppler shift assumption of PUSCH, corresponding to 350km/h at 30GHz carrier
* Recommended WF
  + Define PRACH requirements with frequency offset as 19444Hz under AWGN channel?

**Issue 2-4-2: Test Preamble configuration**

* Observations
  + Observation 1(Nokia): Ncs equal to 69 is the default value used for preamble format C2 in FR2 (120 KHz SCS) PRACH requirements in normal mode
* Proposals
  + Option 1(Samsung, Intel, Huawei, Nokia)
    - Ncs = 69
    - Logical sequence index=0
    - v=0
  + Option 2(Ericsson):
    - Ncs = 0
* Recommended WF
  + Define PRACH requirements with test preamble configuration as ?
    - Ncs = 69
    - Logical sequence index=0
    - v=0

**Issue 2-4-3: Timing offset configuration**

* Proposals
  + Option 1(Ericsson): RAN4 to decide to use between a). Current timing offset configuration; and b). timing offset configuration based on the largest expected cell radius, i.e., derived from scenario B
* Recommended WF
  + More clarification of option 1 is needed.

**Issue 2-4-4: Test error tolerance**

* Proposals
  + Option 1(Samsung): 0.26us for AWGN
* Recommended WF
  + Encourage feedback from companies

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-1-1  Issue 2-1-2  Issue 2-1-3  Issue 2-1-4 |

Sub topic 2-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-2-1  Issue 2-2-2  Issue 2-2-3  Issue 2-2-4 |

Sub topic 2-3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-3-1  Issue 2-3-2  Issue 2-3-3  Issue 2-3-4  Issue 2-3-5  Issue 2-3-6  Issue 2-3-7  Issue 2-3-8  Issue 2-3-9  Issue 2-3-10  Issue 2-3-11  Issue 2-3-12  Issue 2-3-13 |

Sub topic 2-4

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 2-4-1  Issue 2-4-2  Issue 2-4-3  Issue 2-4-4 |

### 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 |
|  |
| YYY | Company A |
| 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”.*

# Topic #3: FR2 HST UE Testablity

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2109216 | Intel | Proposal 5: Do not discuss any testability aspects in HST FR2 WI unless it is captured in WID. |
| R4-2110531 | Huawei, HiSilicon | Proposal 5: Assume static UE and single Probe. Combine RRM and Demod requirements as a single feature to support HST FR2 operation |

## Open issues summary

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

Last RAN4 meeting agreements in the WF R4-2106102

List of open issues

* Sub-Topic 3-1: FR2 HST UE Testability
  + Issue 3-1-1: FR2 HST UE Testability

### Sub-topic 3-1 FR2 HST UE Testability

**Issue 3-1: FR2 HST UE Testability**

* Proposals
  + Option 1(Intel): Do not discuss any testability issue aspects in HST FR2 WI unless it is captured in WID
  + Option 2(Huawei): Assume static UE and single Probe. Combine RRM and Demod requirements as a single feature to support HST FR2 operation
* Recommended WF
  + Based on the latest WID of FR2 HST WI RP-202037, there is no objective related with FR2 HST UE test method. Suggest to postpone the testability issue discussion in RAN4 before RAN-Plenary decision and WID update.

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Issue 3-1-1 : |

### 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 |
|  |
| YYY | Company A |
| 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**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | 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** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | 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