**3GPP TSG-RAN WG4 Meeting #94-e R4-200xxxx**

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

**Agenda item:** 7.13.3

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** Email discussion summary for RAN4#94e\_#87\_LTE\_high\_speed\_enh2\_Demod

**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

The scope of this email discussion are Rel-16 LTE HST BS and UE demodulation requirements, and related agenda items are listed below:

7.13.3 UE Demodulation and CSI requirements (36.101)

7.13.3.1 Extension of demodulation requirements to CA

7.13.3.2 HST-SFN PDSCH demodulation requirements

7.13.3.3 Single tap HST PDSCH demodulation requirements

7.13.4 BS Demodulation requirements (36.104)

7.13.4.1 PUSCH demodulation requirements

7.13.4.2 PRACH requirements

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

For UE demodulation:

* 1st round: Based on received comments, update related CRs
	+ NOTE: If no further updates are needed, CR(s) may be agreed.
* 2nd round: Agree on CRs for TS 36.101

For BS demodulation:

* 1st round: Conclude the method of calculating SNR values for PUSCH and PRACH requirements
* 2nd round: Agree on CRs with final SNR values for TS 36.104 and TS 36.141

# Topic #1: UE Demodulation and CSI requirements (36.101) (7.13.3)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-20xxxxx | Company A | Proposal 1:Observation 1: |
| R4-2000872 | NTT DOCOMO, INC. | CRs to finalize PDSCH demodulation for HST-SFN with 500km/h velocity |
| R4-2001348 | Ericsson | CRs to finalize CA PDSCH demodulation for HST-SFN with 500km/h velocity |

## 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: CRs for UE demodulation

*Sub-topic description:*

This sub-topic deals with finalization of UE demodulation performance requirements with 500km/h velocity.

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

**Issue 1-1-1: Removal of square brackets**

* Proposals
	+ Option 1: Remove all square brackets
	+ Other options are not precluded
* Recommended WF
	+ Remove all square brackets and agree on CRs.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| None | None |

### 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** |
| R4-2000872 |  |
|  |
|  |
| R4-2001348 |  |
|  |
|  |

## Summary for 1st round

### Open issues

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic 1-1** | Tentative agreements: Remove all square brackets and agree on CRs. |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | None | None |

### 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**  |
| R4-2000872 | “agreeable”This CR is agreeable since there are no comments in 1st round. |
| R4-2001348 | “To be revised”Contents are agreeable but cover sheet shall be corrected. |

## Discussion on 2nd round

### Sub-topic 1-1: CRs for UE demodulation

**Issue 1-1-1: Removal of square brackets**

* Recommended WF
	+ Check the revised CR from Ericsson.

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2002424 |  |
|  |  |

## Summary on 2nd round

*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 #2: BS Demodulation requirements (36.104) (7.13.4)

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-20xxxxx | Company A | Proposal 1:Observation 1: |
| R4-2000309 | Samsung | Simulation summary (To be uploaded) |
| R4-2000310 | Samsung | Observation 1: Due to the limited DMRS resource in small bandwidth, it is reasonable that there is performance loss with considering the inaccuracy frequency offset estimation.Observation 2: The maximum Doppler value with 1944Hz is out of range of DMRS frequency offset tracking ability, even the DMRS in PUCCH. To some extent, with large Doppler value, there should be some performance loss.Proposal 1: Encourage companies to provide the simulation results with ideal frequency offset for further alignment.Proposal 2: Additional margin should be considered for deriving requirement, due to the diverse of two DMRS structure in PUSCH and PUCCH. |
| R4-2001452 | Huawei, HiSilicon |  Ideal Simulation results for LTE PUSCH under HST single-tap |
| R4-2001720 | Nokia, Nokia Shanghai Bell | Observation 1: The choice of a Doppler compensation algorithm has an impact on PUSCH performance. Observation 2: The SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b are less than the corresponding SNR for Scenarios 1 and 3, respectively, which seems to be odd. A similar observation is made for Scenario 1-LTE500a and Scenario 3-LTE500a. Proposal 1: SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b that are smaller than the corresponding SNR for Scenario 1 and 3, respectively, should be excluded.  |
| R4-2001718 | Nokia, Nokia Shanghai Bell | Observation 1: The SNR values for 1944 Hz for PRACH format 1, 2 and 3 are less than those for 1875 Hz, which seem to be odd. Observation 2: As the frequency offset for 1944 Hz is slightly larger than 1875 Hz, the minimum SNR for achieving the target PRACH detection probability of 99% should be comparable to but not be less than the SNR values for 1875 Hz. Observation 3: SNR values for the 1875 Hz frequency offset case can be used as a baseline for computing the final SNR based on simulation results of different companies.Proposal 1: SNR values that are smaller or far greater than the corresponding SNR for 1875 Hz should be excluded from the averaging computation.  |

## 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: PUSCH

*Sub-topic description:*

This sub-topic deals with open issues related to PUSCH performance requirements for enhanced HST with 500km/h velocity.

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

**Issue 2-1-1: Simulation alignment**

* Proposals
	+ Option 1 (Samsung): Encourage companies to provide the simulation results with ideal frequency offset for further alignment.
	+ Other options are not precluded
* Recommended WF
	+ Further discussion is needed

**Issue 2-1-2: Additional margin**

* Proposals
	+ Option 1 (Samsung): Additional margin should be considered for deriving requirement, due to the diverse of two DMRS structure in PUSCH and PUCCH.
	+ Other options are not precluded.
* Recommended WF
	+ Further discussion is needed

**Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests**

* Proposals
	+ Option 1 (Nokia): SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b that are smaller than the corresponding SNR for Scenario 1 and 3, respectively, should be excluded.
	+ Other options are not precluded.
* Recommended WF
	+ Further discussion is needed

### Sub-topic 2-2: PRACH

*Sub-topic description*

This sub-topic deals with open issues related to PRACH performance requirements for enhanced HST with 500km/h velocity.

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

**Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests**

* Proposals
	+ Option 1 (Nokia): SNR values that are smaller or far greater than the corresponding SNR for 1875 Hz should be excluded from the averaging computation.
	+ Option 2 (Samsung): Additional margin [0.5]dB
	+ Other options are not precluded
* Recommended WF
	+ Further discussion is needed

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Samsung | Sub topic 2-1:Issue 2-1-1: Simulation alignmentPrefer option 1: Encourage companies to provide the simulation results with ideal frequency offset for further alignmentWith small bandwidth, such as 1.4MHz and 3MHz, the SNR of 70%TP is lower than large bandwidth performance, around 1dB. Due to the limited DMRS resource in small bandwidth, it is reasonable that there is performance loss with considering the inaccuracy frequency offset estimation. While as indicated the simulation summary [2], the performance with different bandwidth in some companies results are very similar.The SNR requirement with 70% TP is about -0.6 to -1.4dB in LTE. The alignment results should be around with -2.6 to -3.4dB with considering 2dB implementation margin. Considering the span of each company alignment result, the best performance should be around with -3.6 to -4.4dB.Compare with LTE Rel-13 with 1340Hz Doppler value in HST open scenario, only the Doppler value is increasing with 1944Hz, To some extent, with large Doppler value, there should be some performance loss.While as indicated in the simulation summary, the SNR with 70% under maximum Doppler value 1944Hz is better than the SNR with 70% under maximum Doppler value 1340Hz in some resultsIssue 2-1-2: Additional marginPrefer option 1: Additional margin should be considered for deriving requirement, due to the diverse of two DMRS structure in PUSCH and PUCCH. E.g. [0.5] dB margin can be considered, similarly other WI in LTE for requirement.Since the PUSCH is considered as the measurement channel to specify the eNB performance for the high-speed train, it should be the baseline of requirement specified. With additional PUCCH configuration, the performance can be improved. Either using DMRS in PUCCH or DMRS in PUSCH for frequency offset estimation depends on BS implementation. From RAN4 perspective, the minimum requirement specified in RAN4 should consider the worst scenario. Considering the diverse of frequency tracking ability for two DMRS structure, we propose to add the additional margin for requirement. For example, LTE, we have already used additional 0.5dB margin for requirement, such as sTTI WIIssue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST testsPrefer option 1: SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b that are smaller than the corresponding SNR for Scenario 1 and 3, respectively, should be excluded.Similar concern with Nokia, as mention in our contribution, the SNR with 70% under maximum Doppler value 1944Hz is better than the SNR with 70% under maximum Doppler value 1340Hz in some results. Compare with LTE, excepting for Doppler value, other simulation parameters are same.Therefore, my understanding there are two proposals to handle the alignment issue, one option is to encourage interested companies to provide the ideal channel estimation results to further align. Another option is to remove some unreasonable results case by case.Based on current summary result, most of results can be aligned. If no companies prefer to provide the ideal results with considering the effort and WI schedule, we agree with Nokia to remove some unreasonable results for requirement deriving.Sub topic 2-2:Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH testsPrefer to use the different rule with PUSCH to handle the alignment of SNR for PRACHDifferent with PUSCH, there is no strictly relationship for high frequency offset will results in the bad performance for PRACH. It depends on the PRACH detection window size, SCS of PRACH, restricted set. Generally, the performance of 625Hz and 1875Hz should be the worst performance, where the value of 625Hz is the 0.5 times of SCS (1.25KHz), and 1875Hz is the 1.5 times of SCS (1.25Khz).In RAN1 design, Normally, restricted set type A can allow the maximum Doppler value is 1.25KHz. For larger then 1250KHz, the correlation peak will be out of the (0, ±du) detection windows, which results in the detection ambiguity with cyclic shift. As for restricted set type B, it can allow five detection windows with (0,±du, ±2 du)., and up to 2500KHzIn case with 625Hz and 1875Hz, he receiver is in difficult condition because several correlation peaks are observed, which results in the detection ambiguity with cyclic shift While with 1944Hz, the strong correlation peak is far from the position of 1875Hz. So, it is expected that the performance of 1944Hz is slightly better than 1875Hz. The similar situation is existed for NR HST, the performance of 2334Hz is slightly better than 1875Hz. The reason is the strong correlation peak is close to 2500Hz. In that sense, we prefer to handle the unaligned results case by case, different rule with PUSCH. One option is to add [0.5]dB margin. |
| Huawei | Sub-topic 2-1: Issue 2-1-1: As per the latest result summary R4-2000309, only 3 cases still with diverse results, we do encourage company to double check and update their results if possible and try to align with each other. If still diverse results are left finally, RAN4 should discuss way forward how to handle the final requirements definition for those 3 cases, such as add additional margin, allow larger span or not take those results that cause larger span into account, etc., Issue 2-1-3: We have a little bit different view from Option 1. Take tunnel 5MHz scenario as an example, the simulation results provided by companies are shown below and we can observe the problem that average result for 1750Hz is worse than that for 1944Hz. However, when we only consider the results from companies who provide both 1750Hz and 1944Hz results, there is no such problem. The reason can be inferred that the companies who provide results are different and different companies use different frequency offset compensation algorithm so that there is some deviation about the average result. The same situation also exists between 1750Hz results and 1340Hz results which can be found in R4-082608.

|  |  |
| --- | --- |
| Tunnel 5MHz | Value(dB) |
| 1750Hz | 1944Hz |
| Samsung | 1.50 | 1.60 |
| Ericsson | 0.80 | 0.80 |
| Nokia | 1.66 | - |
| Huawei | 0.43 | 0.43 |
| Average(from R4-2000309) | 1.10 | 0.94 |
| Average(companies that provide both 1750Hz and 1944Hz results) | 0.91 | 0.94 |

For 1944Hz cases, we do not think that the average results should be affected by 1750Hz result.For 1750Hz cases, similarly, we do not think that the average results should be affected by 1340Hz results.Therefore, we think that each scenario should be discussed separately and do not consider the impact of other scenarios considering the results from different companies and for different scenarios.Similar view for PRACH requirements handling. |
| Nokia, Nokia Shanghai Bell | Sub-topic 2-1Issue 2-1-1: Simulation alignmentExamining the summary of simulation results (R4-2000309) for PUSCH, two open issues:1. The span of PUSCH for Open space scenario for 1750 Hz is greater than 2.5 dB but less than 3 dB. 2. The span of the other cases is less than 2 dB, but many of the average values are better than the corresponding HST Scenarios 1 (1350 Hz) and 3 (1150 Hz). For bullet 1, a span greater than 2 dB can be expected since different Doppler compensation algorithms are used depending on implementation. If Doppler estimation is based on PUCCH DM-RS, then running simulations with ideal frequency offset estimations would not change the simulation results. It is not clear if ideal frequency offset was used in the Rel-14 HST simulations.For bullet 2, it is a concern if many of the average values are better than the corresponding HST Scenarios 1 (1350 Hz) and 3 (1150 Hz). Issue 2-1-2: Additional marginOption 1 is suited to address the open issue in bullet 2 above only. One question is if the margin used to derive the impairment results for HST Scenario 1/3 and HST Scenario 1-LTE500/3-LTE500 is the same? The same margin should be used.Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST testsOption 1 can be applied to address both bullets 1 and 2.Sub-topic 2-2Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH testsObservations in R4-2001718 are based on simulation results. In addition to frequency offset 1944 Hz, simulations for 1875 Hz were run. Our simulation results do not show a significant difference between the two frequency offsets. An example is given below for 1875 Hz and 1944 Hz (without impairment) to confirm our observations. This is also not unexpected as the difference in the frequency is 69 Hz = 1944 Hz – 1875 Hz.Examining the summary of simulation results (R4-2000309), two open issues:1. The span of Format 0 (2/4/8 Rx) is greater than 3 dB
2. The span of the other formats is less than 2 dB, but the average is slightly better than 1875 Hz.

One question is if the margin used to derive the impairment results for 1944 Hz and 1875 Hz is the same? The same margin should be used. The proposed option by Samsung to add a margin is an option to consider. However, it does not address the open issue in bullet 1.  |
| Ericsson | Sub topic 2-1-1: No update our result from the last meeting. Let’s check the results. Sub topic 2-1-2: It depends on the alignment status. If span is small, e.g., < 2dB, then we can set the requirements as usual. Same as other sub topics 2-1-3/2-1-4, we suggest to reviewing the updated simulation result summary, then discuss how to set requirements case by case in the 2nd round. Sub topic 2-1-3: If we understand correctly the option 1 proposal by Nokia, does this mean the companies ideal simulation results for scenario 1-LTE500b and 3-LTE500b that are smaller than the corresponding SNR for scenario 1 and 3, respectively, in TS36.104, are excluded from the averaging computation? It could be one way if companies agree but we propose to review the updated simulation result summary first (same as 2-1-2) and then discuss how to derive the requirements in the 2nd round. Sub topic 2-2-1: Same comment as 2-1-3. It could be one way if companies agree but we propose to review the updated simulation result summary first and then discuss how to derive the requirements in the 2nd round.We would like to ask the moderator to highlight the test cases with large span (e.g., 2dB) after the 1st round.  |
| NTT DOCOMO | Sub-topic 2-1-1: Taking into account of work plan, we need to conclude the requirements during this meeting, so we prefer to derive the requirements based on simulation results provided in this meeting.Sub-topic 2-1-3: Based on the current simulation results in R4-2000309, the most of impairment results (Scenario 1-LTE500 and 3-LTE500) seem to be better performance than existing HST (Scenario 1 and 3) requirements. We need to discuss further one by one about how to derive the requirements.Sub-topic 2-2-1: Based on latest simulation results provided from companies, for format 0, a span of simulation results is larger than 2dB, but the results seem to be aligned among Ericsson, Nokia and Samsung. We need further check on ideal simulation results for alignment.For format 1/2/3, the most of results provided by companies are better than existing SNR values for 1875Hz frequency offset, so we couldn't solve this issue even if we take Option 1. We added information into the following excel file for simulation summary in order to derive the requirements, and highlighted cases that are not align with existing requirements in red.“R4-2000309 Simulation results summary of BS demodulation requirement for LTE Rel-16 HST\_Huawei\_DCM.xlsm” For PUSCH, we observed that the most of impairment simulation results have better SNR values than existing HST requirements.For PRACH format 0, we need further check on Huawei’s simulation results since other companies’ simulation results are already aligned. For PRACH format 1/2/3, we observed that [0.5]dB additional margin can solve the issue of the alignment with existing PRACH requirement for 1875Hz frequency offset.  |

### 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:* |
| **Sub-topic 2-1** | **Issue 2-1-1: Simulation alignment*** Candidate options
	+ Option 1 (Samsung): Encourage companies to provide the simulation results with ideal frequency offset for further alignment.
	+ Other options are not precluded
* Recommended for 2nd round
	+ Taking into account of WI deadline, conclude the requirements based on simulation results provided in this meeting.

**Issue 2-1-2: Additional margin*** Candidate options
	+ Option 1 (Samsung): Additional margin should be considered for deriving requirement, due to the diverse of two DMRS structure in PUSCH and PUCCH.
		- Option 1-1: 0.5dB additional margin
		- Other values are not precluded
	+ Option 2: No additional margin
* Recommended for 2nd round
	+ Option 1-1

**Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests*** Candidate options
	+ Option 1 (Nokia): SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b that are smaller than the corresponding SNR for Scenario 1 and 3, respectively, should be excluded.
	+ Option 2: Reuse existing SNR values for Scenario 1 and 3 when SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b are smaller than the corresponding SNR for Scenario 1 and 3, respectively.
	+ Option 3 (Huawei): All the enhanced performance requirements should be based on the submitted results for the corresponding scenarios. No need to align with existing performance requirements.
	+ Other options are not precluded.
* Recommended for 2nd round
	+ - Need further discussion

**Issue 2-1-4: Simulation alignment for span>2dB cases**  **(Moderator added this issue after 1st round)*** Candidate options
	+ Option 1: Allow larger ideal span than 2dB
	+ Option 2: The results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation until the ideal span is <=2dB
	+ Other options are not precluded
* Recommended for 2nd round
	+ Option 2

**Issue 2-1-5: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.2.3.1-1 and TS36.141 V16.4.0 Table 8.2.4.5-1 (Moderator added this issue after 1st round)*** Candidate options
	+ Option 1: Remove all square brackets
	+ Option 2: Keep square brackets
* Recommended for 2nd round
	+ Option 1

Based on the latest simulation summary, conclude SNR values for PUSCH HST and agree on CRs to update SNR values.We would like to ask new tdoc numbers for the following CRs:* CR to TS 36.104 Updates of PUSCH performance requirements for enhanced HST scenario
	+ Source: NTT DOCOMO, INC.
* CR to TS 36.141 Updates of PUSCH performance requirements for enhanced HST scenario
	+ Source: NTT DOCOMO, INC.
 |
| **Sub-topic 2-2** | **Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests*** Candidate options
	+ Option 1 (Nokia): SNR values that are smaller or far greater than the corresponding SNR for 1875 Hz should be excluded from the averaging computation.
	+ Option 3 (Huawei): All the enhanced performance requirements should be based on the submitted results for the corresponding scenarios. No need to align with existing performance requirements.
	+ Other options are not precluded
* Recommended for 2nd round
	+ Need further discussion

**Issue 2-2-2: Simulation alignment for span > 2dB cases (i.e., PRACH format 0) (Moderator added this issue after 1st round)*** Candidate options
	+ Option 1: Allow larger ideal span than 2dB
	+ Option 2: The results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation until the ideal span is <=2dB
	+ Option 3: Adopt the same SNR values as for 1875Hz frequency offset
	+ Other options are not precluded
* Recommended for 2nd round
	+ Option 2

**Issue 2-2-3: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.4.2.1-5 and TS36.141 V16.4.0 Table 8.4.2.1-5 (Moderator added this issue after 1st round)*** + Option 1: Remove all square brackets
	+ Option 2: Keep square brackets
* Recommended for 2nd round
	+ Option 1

**Issue 2-2-5: Additional margin (Moderator added this issue after 1st round)*** Candidate options
	+ Option 1 (Samsung): Additional margin [0.5]dB
	+ Option 2: No additional margin
* Recommended for 2nd round
	+ Option 1

Based on the latest simulation summary, conclude SNR values for PRACH restricted set type B with 1944Hz frequency offset and agree on CRs to update SNR values.We would like to ask new tdoc numbers for the following CRs:* CR to TS 36.104 Updates of PRACH performance requirements for enhanced HST scenario
	+ Source: NTT DOCOMO, INC.
* CR to TS 36.141 Updates of PRACH performance requirements for enhanced HST scenario
	+ Source: NTT DOCOMO, INC
 |

Moderator: For discussion in 2nd round, SNR values for PUSCH based on candidate options are summarized below:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | **Doppler Value** | **BW** | **Test metric** | **Candidate options to derive SNR for TS 36.104** | **Final** **SNR for TS 36.104** |  | **Reference****TS36.104** |
| **Issue 2-1-4****Option 1****w/o additional margin** | **Issue 2-1-4****Option 1****w/ 0.5dB additional margin** | **Issue 2-1-4****Option 2****w/o additional margin** | **Issue 2-1-4****Option 2****w/ 0.5dB additional margin** |  | **Doppler Value** | **SNR** |
| Open space | 1944Hz | 1.4MHz | 30% TP | -5.4  | -4.9 | -5.4 | -4.9 |  |  | 1340Hz | -3.9 |
| 70% TP | -1.2  | -0.7 | -1.2 | -0.7 |  |  | -0.6 |
| 3MHz | 30% TP | -5.7  | -5.2 | -5.7 | -5.2 |  |  | -4.5 |
| 70% TP | -1.4  | -0.9 | -1.4 | -0.9 |  |  | -1 |
| 5MHz | 30% TP | -6.5  | -6.0 | -6.5 | -6.0 |  |  | -5.1 |
| 70% TP | -2.1  | -1.6 | -2.1 | -1.6 |  |  | -1.4 |
| 10MHz | 30% TP | -6.1  | -5.6 | -6.1 | -5.6 |  |  | -5.4 |
| 70% TP | -1.6  | -1.1 | -1.6 | -1.1 |  |  | -1.5 |
| 15MHz | 30% TP | -6.6  | -6.1 | -6.6 | -6.1 |  |  | -5.2 |
| 70% TP | -2.1  | -1.6 | -2.1 | -1.6 |  |  | -1.4 |
| 20MHz | 30% TP | -6.2  | -5.7 | -6.2 | -5.7 |  |  | -5.3 |
| 70% TP | -1.6  | -1.1 | -1.6 | -1.1 |  |  | -1.4 |
| 1750Hz | 1.4MHz | 30% TP | -5.3  | -4.8 | -5.3 | -4.8 |  |  | 1340Hz | -3.9 |
| 70% TP | -1.1  | -0.6 | -1.1 | -0.6 |  |  | -0.6 |
| 3MHz | 30% TP | -5.7  | -5.2 | -5.7 | -5.2 |  |  | -4.5 |
| 70% TP | -1.2  | -0.7 | -1.2 | -0.7 |  |  | -1 |
| 5MHz | 30% TP | -6.3  | -5.8 | -6.3 | -5.8 |  |  | -5.1 |
| 70% TP | -1.6  | -1.1 | -2.2 | -1.7 |  |  | -1.4 |
| 10MHz | 30% TP | -5.9  | -5.4 | -5.9 | -5.4 |  |  | -5.4 |
| 70% TP | -1.2  | -0.7 | -1.2 | -0.7 |  |  | -1.5 |
| 15MHz | 30% TP | -6.3  | -5.8 | -6.3 | -5.8 |  |  | -5.2 |
| 70% TP | -1.6  | -1.1 | -2.1 | -1.6 |  |  | -1.4 |
| 20MHz | 30% TP | -6.1  | -5.6 | -6.1 | -5.6 |  |  | -5.3 |
| 70% TP | -1.3  | -0.8 | -1.7 | -1.2 |  |  | -1.4 |
| Tunnel for multi-antenna | 1944Hz | 1.4MHz | 30% TP | -2.4  | -1.9 | -2.4 | -1.9 |  |  | 1150Hz | -1.5 |
| 70% TP | 1.8  | 2.3 | 1.8 | 2.3 |  |  | 1.9 |
| 3MHz | 30% TP | -2.8  | -2.3 | -2.8 | -2.3 |  |  | -2.1 |
| 70% TP | 1.8  | 2.3 | 1.8 | 2.3 |  |  | 1.6 |
| 5MHz | 30% TP | -3.5  | -3.0 | -3.5 | -3.0 |  |  | -2.6 |
| 70% TP | 0.9  | 1.4 | 0.9 | 1.4 |  |  | 1.3 |
| 10MHz | 30% TP | -3.1  | -2.6 | -3.1 | -2.6 |  |  | -2.7 |
| 70% TP | 1.7  | 2.2 | 1.7 | 2.2 |  |  | 1.2 |
| 15MHz | 30% TP | -3.6  | -3.1 | -3.6  | -3.1 |  |  | -2.7 |
| 70% TP | 1.0  | 1.5 | 1.0  | 1.5 |  |  | 1.2 |
| 20MHz | 30% TP | -3.1  | -2.6 | -3.1  | -2.6 |  |  | -2.7 |
| 70% TP | 1.5  | 2.0 | 1.5  | 2.0 |  |  | 1.2 |
| 1750Hz | 1.4MHz | 30% TP | -2.7  | -2.2 | -2.7  | -2.2 |  |  | 1150Hz | -1.5 |
| 70% TP | 1.7  | 2.2 | 1.7  | 2.2 |  |  | 1.9 |
| 3MHz | 30% TP | -2.9  | -2.4 | -2.9  | -2.4 |  |  | -2.1 |
| 70% TP | 1.7  | 2.2 | 1.7  | 2.2 |  |  | 1.6 |
| 5MHz | 30% TP | -3.7  | -3.2 | -3.7  | -3.2 |  |  | -2.6 |
| 70% TP | 1.1  | 1.6 | 1.1  | 1.6 |  |  | 1.3 |
| 10MHz | 30% TP | -3.1  | -2.6 | -3.1  | -2.6 |  |  | -2.7 |
| 70% TP | 1.7  | 2.2 | 1.7  | 2.2 |  |  | 1.2 |
| 15MHz | 30% TP | -3.7  | -3.2 | -3.7  | -3.2 |  |  | -2.7 |
| 70% TP | 1.2  | 1.7 | 1.2  | 1.7 |  |  | 1.2 |
| 20MHz | 30% TP | -3.2  | -2.7 | -3.2  | -2.7 |  |  | -2.7 |
| 70% TP | 1.8  | 2.3 | 1.8  | 2.3 |  |  | 1.2 |
| NOTE 1: SNR values, that are smaller than existing SNR values for corresponding Scenario 1 and 3, are highlighted in yellow.NOTE 2: Test cases with the ideal span > 2dB are highlighted in blue. |

Moderator: For discussion in 2nd round, SNR values for PRACH based on candidate options are summarized below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Format** | **Antenna configuration** | **Frequency offset** | **Candidate options to derive SNR for TS 36.104** | **Final****SNR for TS 36.104** |  | **Reference****TS36.104** |
| **Issue-2-2-2****Option 1****w/o additional margin** | **Issue-2-2-2****Option 1****w/ 0.5 dB additional margin** | **Issue-2-2-2****Option 2****w/o additional margin** | **Issue-2-2-2****Option 2****w/ 0.5 dB additional margin** | **Issue-2-2-2****Option 3** |  | **Frequency offset** | **SNR** |
| Format0 | 1x2 | 1944Hz | -11.2 | -10.7 | -11.9 | -11.4  | -11.8 |  |  | 1875Hz | -11.8 |
| Format0 | 1x4 | -13.7 | -13.2 | -14.4 | -13.9 | -14.2 |  |  | -14.2 |
| Format0 | 1x8 | -16.1 | -15.6 | -16.5 | -16.0  | -16.3 |  |  | -16.3 |
| Format1 | 1x2 | -11.6 | -11.1 | -11.6 | -11.1  | -11.4 |  |  | -11.4 |
| Format1 | 1x4 | -14.0 | -13.5 | -14.0 | -13.5  | -13.8 |  |  | -13.8 |
| Format1 | 1x8 | -16.2 | -15.7 | -16.2 | -15.7  | -16.0 |  |  | -16.0 |
| Format2 | 1x2 | -14.1 | -13.6 | -14.1. | -13.6  | -13.8 |  |  | -13.8 |
| Format2 | 1x4 | -16.5 | -16.0 | -16.5 | -16.0  | -15.9 |  |  | -15.9 |
| Format2 | 1x8 | -18.5 | -18.0 | -18.5 | -18.0  | -18.0 |  |  | -18.0 |
| Format3 | 1x2 | -14.3 | -13.8 | -14.3 | -13.8  | -14.0 |  |  | -14.0 |
| Format3 | 1x4 | -16.6 | -16.1 | -16.6 | -16.1  | -16.3 |  |  | -16.3 |
| Format3 | 1x8 | -18.7 | -18.2 | -18.7 | -18.2 | -18.4 |  |  | -18.4 |
| NOTE 1: SNR values, that are smaller than existing SNR values for corresponding Scenario 1 and 3, are highlighted in yellow.NOTE 2: Test cases with the ideal span > 2dB are highlighted in blue. |

Information: As highlighted in yellow, existing PRACH format 3 has similar issue as Issue 2-2-1.

Table 8.4.2.1-5 PRACH missed detection requirements for High speed Mode restricted set type B

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Propagation conditions and****correlation matrix (Annex B)** | **Frequency offset** | **SNR [dB]** |
| **Burst format 0** | **Burst format 1** | **Burst format 2** | **Burst format 3** |
| 1 | 2 | AWGN | 0 | -14.5 | -14.1 | -16.7 | -16.8 |
| AWGN | 625 | -12.0 | -11.7 | -13.9 | -13.9 |
| ETU 70 Low | 270 Hz | -7.3 | -6.9 | -9.1 | -9.2 |
| AWGN | 1875 Hz | -11.8 | -11.4 | -13.8 | -14.0 |
| 4 | AWGN | 0 | -17.1 | -16.6 | -19.1 | -19.1 |
| AWGN | 625 | -14.4 | -14.1 | -16.1 | -16.2 |
| ETU 70 Low | 270 Hz | -11.8 | -11.3 | -13.5 | -13.4 |
| AWGN | 1875 Hz | -14.2 | -13.8 | -15.9 | -16.3 |
| 8 | AWGN | 0 | -19.6 | -19.1 | -21.2 | -21.2 |
| AWGN | 625 | -16.4 | -16.3 | -18.1 | -18.2 |
| ETU 70 Low | 270 Hz | -15.3 | -15.1 | -17.1 | -17.5 |
| AWGN | 1875 Hz | -16.3 | -16.0 | -18.0 | -18.4 |

*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”* |
| R4-20xxxxx | Please assign new tdoc for the following CR: CR to TS 36.104 Updates of PUSCH performance requirements for enhanced HST scenario |
| R4-20xxxxx | Please assign new tdoc for the following CR: CR to TS 36.141 Updates of PUSCH performance requirements for enhanced HST scenario |
| R4-20xxxxx | Please assign new tdoc for the following CR: CR to TS 36.104 Updates of PRACH performance requirements for enhanced HST scenario |
| R4-20xxxxx | Please assign new tdoc for the following CR: CR to TS 36.141 Updates of PRACH performance requirements for enhanced HST scenario |

## Discussion on 2nd round

### Open issues summary for 2st round

#### 2.5.1.1 Sub-topic 2-1: PUSCH

**Issue 2-1-1: Simulation alignment**

* Candidate options
	+ Option 1 (Samsung): Encourage companies to provide the simulation results with ideal frequency offset for further alignment.
	+ Other options are not precluded
* Recommended WF
	+ Taking into account of WI deadline, conclude the requirements based on simulation results provided in this meeting.

**Issue 2-1-2: Additional margin**

* Candidate options
	+ Option 1 (Samsung, Huawei, Nokia): Additional margin should be considered for deriving requirement, due to the diverse of two DMRS structure in PUSCH and PUCCH.
		- Option 1-1: 0.5dB additional margin
		- Other values are not precluded
	+ Option 2 (Ericsson if take Option 2 in Issue 2-1-3, DCM): No additional margin
* Recommended WF
	+ Option 1-1

**Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests**

* Candidate options
	+ Option 1 (Nokia): SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b that are smaller than the corresponding SNR for Scenario 1 and 3, respectively, should be excluded.
	+ Option 2 (Ericsson, Samsung, Nokia, DCM): Reuse existing SNR values for Scenario 1 and 3 when SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b are smaller than the corresponding SNR for Scenario 1 and 3, respectively.
	+ Option 3 (Huawei): All the enhanced performance requirements should be based on the submitted results for the corresponding scenarios. No need to align with existing performance requirements.
	+ Other options are not precluded.
* Recommended WF
	+ Need further discussion

**Issue 2-1-4: Simulation alignment for span>2dB cases (Moderator added this issue after 1st round)**

* Candidate options
	+ Option 1(Samsung): Allow larger ideal span than 2dB
	+ Option 2 (Huawei, Nokia, DCM): The results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation until the ideal span is <=2dB
	+ Other options are not precluded
* Recommended WF
	+ Option 2

**Issue 2-1-5: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.2.3.1-1 and TS36.141 V16.4.0 Table 8.2.4.5-1 (Moderator added this issue after 1st round)**

* Candidate options
	+ Option 1 (Huawei): Remove all square brackets
	+ Option 2 (Ericsson, Samsung): Keep square brackets
* Recommended WF
	+ Option 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | **Doppler Value** | **BW** | **Test metric** | **Candidate options to derive SNR for TS 36.104** | **Final** **SNR for TS 36.104** |  | **Reference****TS36.104** |
| **Issue 2-1-4****Option 1****w/o additional margin** | **Issue 2-1-4****Option 1****w/ 0.5dB additional margin** | **Issue 2-1-4****Option 2****w/o additional margin** | **Issue 2-1-4****Option 2****w/ 0.5dB additional margin** |  | **Doppler Value** | **SNR** |
| Open space | 1944Hz | 1.4MHz | 30% TP | -5.4  | -4.9 | -5.4 | -4.9 | -3.9 |  | 1340Hz | -3.9 |
| 70% TP | -1.2  | -0.7 | -1.2 | -0.7 | -0.6 |  | -0.6 |
| 3MHz | 30% TP | -5.7  | -5.2 | -5.7 | -5.2 | -4.5 |  | -4.5 |
| 70% TP | -1.4  | -0.9 | -1.4 | -0.9 | -1 |  | -1 |
| 5MHz | 30% TP | -6.5  | -6.0 | -6.5 | -6.0 | -5.1 |  | -5.1 |
| 70% TP | -2.1  | -1.6 | -2.1 | -1.6 | -1.4 |  | -1.4 |
| 10MHz | 30% TP | -6.1  | -5.6 | -6.1 | -5.6 | -5.4 |  | -5.4 |
| 70% TP | -1.6  | -1.1 | -1.6 | -1.1 | -1.5 |  | -1.5 |
| 15MHz | 30% TP | -6.6  | -6.1 | -6.6 | -6.1 | -5.2 |  | -5.2 |
| 70% TP | -2.1  | -1.6 | -2.1 | -1.6 | -1.4 |  | -1.4 |
| 20MHz | 30% TP | -6.2  | -5.7 | -6.2 | -5.7 | -5.3 |  | -5.3 |
| 70% TP | -1.6  | -1.1 | -1.6 | -1.1 | -1.4 |  | -1.4 |
| 1750Hz | 1.4MHz | 30% TP | -5.3  | -4.8 | -5.3 | -4.8 | -3.9 |  | 1340Hz | -3.9 |
| 70% TP | -1.1  | -0.6 | -1.1 | -0.6 | -0.6 |  | -0.6 |
| 3MHz | 30% TP | -5.7  | -5.2 | -5.7 | -5.2 | -4.5 |  | -4.5 |
| 70% TP | -1.2  | -0.7 | -1.2 | -0.7 | -1 |  | -1 |
| 5MHz | 30% TP | -6.3  | -5.8 | -6.3 | -5.8 | -5.1 |  | -5.1 |
| 70% TP | -1.6  | -1.1 | -2.2 | -1.7 | -1.4 |  | -1.4 |
| 10MHz | 30% TP | -5.9  | -5.4 | -5.9 | -5.4 | -5.4 |  | -5.4 |
| 70% TP | -1.2  | -0.7 | -1.2 | -0.7 | -1.2 |  | -1.5 |
| 15MHz | 30% TP | -6.3  | -5.8 | -6.3 | -5.8 | -5.2 |  | -5.2 |
| 70% TP | -1.6  | -1.1 | -2.1 | -1.6 | -1.4 |  | -1.4 |
| 20MHz | 30% TP | -6.1  | -5.6 | -6.1 | -5.6 | -5.3 |  | -5.3 |
| 70% TP | -1.3  | -0.8 | -1.7 | -1.2 | -1.4 |  | -1.4 |
| Tunnel for multi-antenna | 1944Hz | 1.4MHz | 30% TP | -2.4  | -1.9 | -2.4 | -1.9 | -1.5 |  | 1150Hz | -1.5 |
| 70% TP | 1.8  | 2.3 | 1.8 | 2.3 | 1.9 |  | 1.9 |
| 3MHz | 30% TP | -2.8  | -2.3 | -2.8 | -2.3 | -2.1 |  | -2.1 |
| 70% TP | 1.8  | 2.3 | 1.8 | 2.3 | 1.8 |  | 1.6 |
| 5MHz | 30% TP | -3.5  | -3.0 | -3.5 | -3.0 | -2.6 |  | -2.6 |
| 70% TP | 0.9  | 1.4 | 0.9 | 1.4 | 1.3 |  | 1.3 |
| 10MHz | 30% TP | -3.1  | -2.6 | -3.1 | -2.6 | -2.7 |  | -2.7 |
| 70% TP | 1.7  | 2.2 | 1.7 | 2.2 | 1.7 |  | 1.2 |
| 15MHz | 30% TP | -3.6  | -3.1 | -3.6  | -3.1 | -2.7 |  | -2.7 |
| 70% TP | 1.0  | 1.5 | 1.0  | 1.5 | 1.2 |  | 1.2 |
| 20MHz | 30% TP | -3.1  | -2.6 | -3.1  | -2.6 | -2.7 |  | -2.7 |
| 70% TP | 1.5  | 2.0 | 1.5  | 2.0 | 1.5 |  | 1.2 |
| 1750Hz | 1.4MHz | 30% TP | -2.7  | -2.2 | -2.7  | -2.2 | -1.5 |  | 1150Hz | -1.5 |
| 70% TP | 1.7  | 2.2 | 1.7  | 2.2 | 1.9 |  | 1.9 |
| 3MHz | 30% TP | -2.9  | -2.4 | -2.9  | -2.4 | -2.1 |  | -2.1 |
| 70% TP | 1.7  | 2.2 | 1.7  | 2.2 | 1.7 |  | 1.6 |
| 5MHz | 30% TP | -3.7  | -3.2 | -3.7  | -3.2 | -2.6 |  | -2.6 |
| 70% TP | 1.1  | 1.6 | 1.1  | 1.6 | 1.3 |  | 1.3 |
| 10MHz | 30% TP | -3.1  | -2.6 | -3.1  | -2.6 | -2.7 |  | -2.7 |
| 70% TP | 1.7  | 2.2 | 1.7  | 2.2 | 1.7 |  | 1.2 |
| 15MHz | 30% TP | -3.7  | -3.2 | -3.7  | -3.2 | -2.7 |  | -2.7 |
| 70% TP | 1.2  | 1.7 | 1.2  | 1.7 | 1.2 |  | 1.2 |
| 20MHz | 30% TP | -3.2  | -2.7 | -3.2  | -2.7 | -2.7 |  | -2.7 |
| 70% TP | 1.8  | 2.3 | 1.8  | 2.3 | 1.8 |  | 1.2 |
| NOTE 1: SNR values, that are smaller than existing SNR values for corresponding Scenario 1 and 3, are highlighted in yellow.NOTE 2: Test cases with the ideal span > 2dB are highlighted in blue. |

#### 2.5.1.2 Sub-topic 2-2: PRACH

**Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests**

* Candidate options
	+ Option 1 (Nokia): SNR values that are smaller or far greater than the corresponding SNR for 1875 Hz should be excluded from the averaging computation.
	+ Option 3 (Huawei, Samsung?): All the enhanced performance requirements should be based on the submitted results for the corresponding scenarios. No need to align with existing performance requirements.
	+ Option 4 (Ericsson, Nokia?, DCM): Reuse existing SNR values for Frequency offset of 1875Hz when SNR values for 1944Hz are smaller than the corresponding SNR for 1875Hz, respectively
	+ Other options are not precluded
* Recommended WF
	+ Need further discussion

**Issue 2-2-2: Simulation alignment for span > 2dB cases (i.e., PRACH format 0) (Moderator added this issue after 1st round)**

* Candidate options
	+ Option 1 (Samsung): Allow larger ideal span than 2dB
	+ Option 2 (Huawei): The results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation until the ideal span is <=2dB
	+ Option 3 (Samsung, Nokia, DCM): Adopt the same SNR values as for 1875Hz frequency offset
	+ Other options are not precluded
* Recommended WF
	+ Option 2

**Issue 2-2-3: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.4.2.1-5 and TS36.141 V16.4.0 Table 8.4.2.1-5 (Moderator added this issue after 1st round)**

* Candidate options
	+ Option 1 (Huawei): Remove all square brackets
	+ Option 2 (Ericsson, Samsung): Keep square brackets
* Recommended WF
	+ Option 1

**Issue 2-2-5: Additional margin (Moderator added this issue after 1st round)**

* Candidate options
	+ Option 1 (Samsung, Huawei (for cases with large span only), Nokia): Additional margin [0.5]dB
	+ Option 2 (DCM): No additional margin
* Recommended WF
	+ Option 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Format** | **Antenna configuration** | **Frequency offset** | **Candidate options to derive SNR for TS 36.104** | **Final****SNR for TS 36.104** |  | **Reference****TS36.104** |
| **Issue-2-2-2****Option 1****w/o additional margin** | **Issue-2-2-2****Option 1****w/ 0.5 dB additional margin** | **Issue-2-2-2****Option 2****w/o additional margin** | **Issue-2-2-2****Option 2****w/ 0.5 dB additional margin** | **Issue-2-2-2****Option 3** |  | **Frequency offset** | **SNR** |
| Format0 | 1x2 | 1944Hz | -11.2 | -10.7 | -11.9 | -11.4  | -11.8 | -11.8 |  | 1875Hz | -11.8 |
| Format0 | 1x4 | -13.7 | -13.2 | -14.4 | -13.9 | -14.2 | -14.2 |  | -14.2 |
| Format0 | 1x8 | -16.1 | -15.6 | -16.5 | -16.0  | -16.3 | -16.3 |  | -16.3 |
| Format1 | 1x2 | -11.6 | -11.1 | -11.6 | -11.1  | -11.4 | -11.4 |  | -11.4 |
| Format1 | 1x4 | -14.0 | -13.5 | -14.0 | -13.5  | -13.8 | -13.8 |  | -13.8 |
| Format1 | 1x8 | -16.2 | -15.7 | -16.2 | -15.7  | -16.0 | -16.0 |  | -16.0 |
| Format2 | 1x2 | -14.1 | -13.6 | -14.1. | -13.6  | -13.8 | -13.8 |  | -13.8 |
| Format2 | 1x4 | -16.5 | -16.0 | -16.5 | -16.0  | -15.9 | -15.9 |  | -15.9 |
| Format2 | 1x8 | -18.5 | -18.0 | -18.5 | -18.0  | -18.0 | -18.0 |  | -18.0 |
| Format3 | 1x2 | -14.3 | -13.8 | -14.3 | -13.8  | -14.0 | -14.0 |  | -14.0 |
| Format3 | 1x4 | -16.6 | -16.1 | -16.6 | -16.1  | -16.3 | -16.3 |  | -16.3 |
| Format3 | 1x8 | -18.7 | -18.2 | -18.7 | -18.2 | -18.4 | -18.4 |  | -18.4 |
| NOTE 1: SNR values, that are smaller than existing SNR values for corresponding Scenario 1 and 3, are highlighted in yellow.NOTE 2: Test cases with the ideal span > 2dB are highlighted in blue. |

### Companies views’ collection for 2st round

#### 2.5.2.1 Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Sub topic 2-1: Issue 2-1-3: We prefer Option 2. According to the updated summary (R4-2000309), most impairment results with 1750/1940Hz are better (lower) that the requirements with lower Doppler scenario specified in TS36.104. If we take Option 1, we cannot calculate the average for some test cases because all the impairment values are lower than the existing case, e.g. Open space, 1.4MHz, 1x2, 1750Hz, 30%TP. On the other hand, we also tend to agree the required SNRs for higher Doppler should be same or higher than the lower Doppler scenario if the condition (e.g., MCS, Channel BW) is same. We understand the receiver algorithm may be improved and contributed companies are different compared with Rel-14 HST, but we also need to keep the consistency of the requirements in TS36.104/141 because many readers do not know how we specify the requirements.Reviewing the simulation summary, we think option 2 is a good compromise.  Issue 2-1-2: Option 2. If we take Option 2 in Issue 2-1-3, it implicitly adds more than 0.5dB as margin to the average of impairment results, and thus we prefer Option 2, no additional margin is needed. Issue 2-1-4: There are three cases whose span > 2.0dB:* Open space, 5MHz, 1x2, 1750Hz, 70% tput
* Open space, 15MHz, 1x2, 1750Hz, 70% tput
* Open space, 20MHz, 1x2, 1750Hz, 70% tput

If we take Option 2 in Issue 2-1-3, we would like to ask companies whether the requirements based on Issue 2-1-3 option 2 is acceptable or we need additional margin for these cases. Issue 2-1-5: We suggest keeping [] in this week. In this meeting, we should focus on removing TBDs. Sub topic 2-2:Issue 2-2-1: It is the same issue as Issue 2-1-3. For example, all the companies’ impairment results with Format 3 1x2 or 1x4 are lower than the lower Doppler case specified in TS36.104. As same as Issue 2-1-3, we propose another option: * Reuse existing SNR values for Frequency offset of 1875Hz when SNR values for 1944Hz are smaller than the corresponding SNR for 1875Hz, respectively

Issue 2-2-2: If companies agree with our proposal in Issue 2-2-1, we would like to ask companies whether the requirements based on Issue 2-2-1 is acceptable or we need additional margin.We would like to ask Huawei to check their simulation setup for Format 0. It looks their simulation results for 1x2, 1x4, and 1x8 are done with 1x1, 1x2, and 1x4, respectively, compared with other companies results and existing requirements for 1875Hz. Issue 2-2-3: Same comment as 2-1-5. We suggest keeping [] in this week. In this meeting, we should focus on removing TBDs. Issue 2-2-5: Option 2, if companies agree with our proposed option in Issue 2-2-1. |
| Huawei, HiSilicon | **Issue 2-1-1: Simulation alignment**We agree with recommended for 2nd round.**Issue 2-1-2: Additional margin**We agree with recommended for 2nd round.**Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests**We prefer Option 3. The existing value in the specification is created from R8-082608, in which we can get that majority companies only provided the impairment results. The final results in the specification was created just simply average all the results without considering correctness of the results even though there was still a big span for some cases. It can be inferred that some companies added a huge margin or used a not good performance algorithm which is outdated from the present perspective. We don’t think alignment is necessary, otherwise we will always be restricted by those ‘bad’ values for current even future enhancement.Nokia says that they could appear to be errors for someone reading the specification if no alignment. We don’t think this is a persuasive argument if alignment is just to make it no errors for non-expert specification reader. Could companies explain why the current results need to be aligned with the existing cases which were defined over 10 years ago?**Issue 2-1-4: Simulation alignment for span>2dB cases**We agree with recommended for 2nd round.**Issue 2-1-5: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.2.3.1-1 and TS36.141 V16.4.0 Table 8.2.4.5-1**We agree with recommended for 2nd round.**Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests**We prefer Option 3. The same view as Issue 2-1-3.Nokia says that they could appear to be errors for someone reading the specification if no alignment. We don’t think this is a persuasive argument if alignment is just to make it no errors for non-expert specification reader. Could companies explain why the current results need to be aligned with the existing cases which were defined over 10 years ago?**Issue 2-2-2: Simulation alignment for span > 2dB cases**We agree with recommendation for 2nd round, i.e. Option 2.**Issue 2-2-3: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.4.2.1-5 and TS36.141 V16.4.0 Table 8.4.2.1-5**We agree with recommended for 2nd round. i.e. Remove the [ ]**Issue 2-2-5: Additional margin**We prefer to consider additional margin [0.5]dB for those cases with larger span only.**2020-03-03:**For PUSCH, as per the 1st and 2nd round discussion, there are two key issues, one is the results of 1750Hz is better than the existing results for 1340Hz, another is that some cases are not well aligned among companies still with larger span > 2dB, based on the principle took in previous LTE BS performance requirements definition, usually companies should align their results with span smaller than 2dB as much as possible, no additional margin should be added on top of the averaged impairment results that is different from UE side. we give our proposal to move forward by taking the PUSCH as example:1: Firstly it is straight forward that we should conclude the requirements based on the results provided in this meeting (Issue 2-1-1);2: How to handle those 3 cases with span larger than 2dB: most companies agree with Option 2 (Issue 2-1-4), if we follow Option 2, no additional margin is needed at all (Issue 2-1-2), because additional margin is usually used for the averaged results derived with some results still with larger span. By following Option 2 (Issue 2-1-4), it means no results with larger span will be taken into account in the final requirements derivation.3: After step 1 and 2, if Issue 2-1-3 still exists, we have two suggestions even if we still do not think it is necessary to compare the existing requirements with new requirements to be defined:Option 1: We suggest that the existing requirements for fd=1340Hz can be deleted from Release 16, we don’t see any sense keeping them in the specification since the enhanced scenario have been defined with the same condition except higher Doppler for BS supporting Release 16.Option 2: The other compromise way is to replace the existing requirements for 1340Hz by using the requirements for 1750Hz derived in this meeting if companies think that the existing requirements for 1340Hz is a little better. For PRACH, we have updated our simulation results. We think Issue 2-2-2 (Simulation alignment for span > 2dB cases) can be solved. Similarly, additional margin (Issue 2-2-5) is no needed. We can also use step 3 above to solve Issue 2-2-1. |
| Samsung | Issue 2-1-1: Simulation alignmentBase on the updated simulation results summary, almost cases are well aligned with span <2dB, some cases with span >2dB. Considering the deadline of WI, we are fine with Recommended WF, and derived the requirement based on the update summary. **Issue 2-1-2: Additional margin**Prefer to add additional margin.Generally, the span of average result with <3dB is allowed, considering the different implementation. For HST, due to DMRS with both PUSCH and PUCCH can be configured. Considering the different Doppler tracking ability of two DMRS structure, It is reasonable to consider some additional margin to compensate the difference of two algorithms. **Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests**Option 2 can be regarded a compromise to handle the results with large Doppler with achieving better performance. **Issue 2-1-4: Simulation alignment for span>2dB cases**  **(Moderator added this issue after 1st round)**Still prefer option 1. Generally, the span of average result with <3dB is allowed. In LTE STTI WI, and NR UE demod, we also relax the condition of range with 2.5dB. Meanwhile, considering the different Doppler tracking ability of two DMRS structure, the performance will be different based on implementation. Follow the LTE approach, we are fine to allow the span of SNR large than 2dB. If larger than 3dB, we can consider the results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation with the ideal span is <=3dB or reusing the existing requirement.**Issue 2-1-5: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.2.3.1-1 and TS36.141 V16.4.0 Table 8.2.4.5-1 (Moderator added this issue after 1st round)**Prefer option 2. Keep the []. Normally when we introduce performance requirements (SNR requirements) into specification first time, a [ ] will be used on SNR requirements. After one or two meetings later, a CR can be used to clean up all the [ ] on performance requirements under this WI. The reserved [ ] just allow companies to further check, in case some particular technical issues identified laterConsidering there are still some cases with large 3dB, we suggest to keep [] to allow companies to check.**Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests**Prefer option 2. Deriving requirement is based on the updated submitted results. As mentioned, The Ncs configuration can has some impact of PRACH detection, different with PUSCH based on DMRS. 1875Hz is 1.5 SCS of PRACH, which has serval peak signals to result in the detection ambiguity.**Issue 2-2-2: Simulation alignment for span > 2dB cases (i.e., PRACH format 0) (Moderator added this issue after 1st round)**Still prefer option 1. Generally, the span of average result with <3dB is allowed. For the case larger than 3dB. If larger 3dB, we can consider the results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation with the ideal span is <=3dB or adopt the same SNR values as for 1875Hz frequency offset.Option 3 can be regarded as a way of compromise **Issue 2-2-3: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.4.2.1-5 and TS36.141 V16.4.0 Table 8.4.2.1-5 (Moderator added this issue after 1st round)**Similar comment with Issue 2-1-5, keep [] at this meeting to allow company to further check.**Issue 2-2-5: Additional margin (Moderator added this issue after 1st round)**Prefer option 1. Additional margin can be considered, which can handle the issue with SNR values that are smaller than the corresponding SNR for 1875 Hz |
| Nokia, Nokia Shanghai Bell | **Issue 2-1-1: Simulation alignment**Recommended WF is OK as the two open issues identified in the 1st round discussion can be addressed in the 2nd round based on the outcome in Issues 2-1-2, 2-1-3, 2-1-4. **Issue 2-1-2: Additional margin**Recommended Option 1-1 is OK. **Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests**Option 2 would overcome the limitations of both Option 1 and Option 3. Thus, Option 2 is a good compromise and is OK.**Issue 2-1-4: Simulation alignment for span>2dB cases**  **(Moderator added this issue after 1st round)**The recommended Option 2 is OK but it would not change the end results if Option 2 is selected in Issue 2-1-3.**Issue 2-1-5: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.2.3.1-1 and TS36.141 V16.4.0 Table 8.2.4.5-1 (Moderator added this issue after 1st round)**No strong view but we understand NTT DoCoMo’s concern regarding concluding requirements at this meeting. **Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests**Option 1 basically would give almost the same results as Option 3 (if selected) in Issue 2-2-2. The table below compares the Option 1 in Issue 2-2-1 and Option 3 in Issue 2-2-2.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Format** | **Antenna configuration** | **Frequency offset** | **Candidate options to derive SNR** **for TS 36.104** | **Final****SNR for TS 36.104** |  | **Reference****TS36.104** |
| **Issue-2-2-1****Option 1****w/o dB additional margin** | **Issue-2-2-2****Option 3** |  |  | **Frequency offset** | **SNR** |
| Format0 | 1x2 | 1944Hz | -11.9 | -11.8 |  |  | 1875Hz | -11.8 |
| Format0 | 1x4 | -14.4 | -14.2 |  |  | -14.2 |
| Format0 | 1x8 | -16.5 | -16.3 |  |  | -16.3 |
| Format1 | 1x2 | -11.5 | -11.4 |  |  | -11.4 |
| Format1 | 1x4 | -13.8 | -13.8 |  |  | -13.8 |
| Format1 | 1x8 | -16.0 | -16.0 |  |  | -16.0 |
| Format2 | 1x2 | -14.0 | -13.8 |  |  | -13.8 |
| Format2 | 1x4 | -16.2 | -15.9 |  |  | -15.9 |
| Format2 | 1x8 | -18.2 | -18.0 |  |  | -18.0 |
| Format3 | 1x2 | -14.2 | -14.0 |  |  | -14.0 |
| Format3 | 1x4 | -16.5 | -16.3 |  |  | -16.3 |
| Format3 | 1x8 | -18.6 | -18.4 |  |  | -18.4 |
| NOTE 1: SNR values, that are smaller than existing SNR values for corresponding Scenario 1 and 3, are highlighted in yellow. |

This issue (Issue 2-2-1) need not to be considered or addressed if Option 3 in Issue 2-2-2 is selected. The proposal by Ericsson:* Reuse existing SNR values for Frequency offset of 1875Hz when SNR values for 1944Hz are smaller than the corresponding SNR for 1875Hz, respectively

Based on our understanding, this is a refinement of Option 1 in issue 2-2-1 and Option 3 in Issue 2-2-2. This proposal is reasonable, where each SNR value is considered separately. However, the end results would be almost the same as Option 3 in Issue 2-2-2.**Issue 2-2-2: Simulation alignment for span > 2dB cases (i.e., PRACH format 0) (Moderator added this issue after 1st round**Option 2 or option 3 give almost the same end results. No strong preference but Option 3 is a good compromise among all the options. Thus, Option 3 is OK. As shown in Issue 2-2-1, Option 3 gives almost the same results as Option 1 (in Issue 2-2-1). If Option 3 is selected, then Issue 2-2-1 need not be considered and, by default, addressed by Option 3 in Issue 2-2-2. **Issue 2-2-3: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.4.2.1-5 and TS36.141 V16.4.0 Table 8.4.2.1-5 (Moderator added this issue after 1st round)**No strong view but we understand NTT DoCoMo’s concern regarding concluding requirements at this meeting. **Issue 2-2-5: Additional margin (Moderator added this issue after 1st round)**Recommended Option 1 is OK but what is the margin? 0.5 dB?  |
| NTT DOCOMO | Sub topic 2-1Issue 2-1-1: We agree with recommended WF.Issue 2-1-2/3: We think reusing existing SNR values is good compromise taking into account of concerns from Samsung and Nokia. We are OK with Option 2 in Issue 2-1-3. Then we don’t need consider additional margin (i.e., Option 2 in Issue 2-1-2).Issue 2-1-4: We agree with recommended WF (Option 2)Issue 2-1-5: It seems that further check is needed. We can focus on removing TBD in this meeting.Sub topic 2-2Issue 2-2-1/2: We can compromise Ericsson’s proposal taking into account of concerns from Nokia.Issue 2-2-3: It seems that further check is needed. We can focus on removing TBD in this meeting.Issue 2-2-5: We think we don’t need additional margin if we take Option 3 in Issue 2-2-2.Regarding Huawei’s proposal, we disagree with Option 1, BS vendor can chose support 350kHz or 500kHz. The requirements should not be deleted. We are OK with Option 2 if other companies can accept this. |

#### 2.5.2.2 CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2002499(TS36.104 for PUSCH) | Company A |
| Company B |
|  |
| R4-2002500(TS36.141 for PUSCH) |  |
|  |
|  |
| R4-2002501(TS36.104 for PRACH) |  |
|  |
|  |
| R4-2002502(TS36.141 for PRACH) |  |
|  |
|  |

## Summary on 2nd round

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

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic 2-1** | **Issue 2-1-1: Simulation alignment*** Tentative agreement
	+ Taking into account of WI deadline, conclude the requirements based on simulation results provided in this meeting.

**Issue 2-1-2: Additional margin*** Tentative agreement
	+ Option 2 (if take Option 2 in Issue 2-1-3): No additional margin

**Issue 2-1-3: Alignment of SNR values between existing and enhanced PUSCH HST tests*** Tentative agreement
	+ Option 2: Reuse existing SNR values for Scenario 1 and 3 when SNR values for Scenario 1-LTE500b and Scenario 3-LTE500b are smaller than the corresponding SNR for Scenario 1 and 3, respectively.
	+ Or

**Issue 2-1-4: Simulation alignment for span>2dB cases**  **(Moderator added this issue after 1st round)*** Tentative agreement
	+ **Option 2: The results farthest from the AVERAGE value is taken out for the AVERAGE and SPAN re-calculation until the ideal span is <=2dB**

**Issue 2-1-5: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.2.3.1-1 and TS36.141 V16.4.0 Table 8.2.4.5-1 (Moderator added this issue after 1st round)*** Tentative agreement
	+ Option 2: Keep square brackets
 |
| **Sub-topic 2-2** | **Issue 2-2-1: Alignment of SNR values between existing and enhanced PRACH tests*** Tentative agreement
	+ Option 4: Reuse existing SNR values for Frequency offset of 1875Hz when SNR values for 1944Hz are smaller than the corresponding SNR for 1875Hz, respectively

**Issue 2-2-2: Simulation alignment for span > 2dB cases (i.e., PRACH format 0) (Moderator added this issue after 1st round)*** Tentative agreement
	+ Option 3: Adopt the same SNR values as for 1875Hz frequency offset

**Issue 2-2-3: Removal of square brackets for the requirements in TS36.104 V16.4.0 Table 8.4.2.1-5 and TS36.141 V16.4.0 Table 8.4.2.1-5 (Moderator added this issue after 1st round)*** Tentative agreement
	+ Option 2: Keep square brackets

**Issue 2-2-5: Additional margin (Moderator added this issue after 1st round)*** Tentative agreement
	+ Option 2 (If adopt Option 3 in Issue 2-2-2): No additional margin
 |

|  |  |
| --- | --- |
| **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”* |