**3GPP TSG-RAN WG4 Meeting # 96-e R4-200XXXX**

**Electronic Meeting, 17 – 28 Aug., 2020**

**Agenda item:** 7.18.3

**Source:** Moderator (ZTE Corporation)

**Title:** Email discussion summary for [96e][325] BS demodulation for 2-step RACH

**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

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2010283 Discussion and simulation results for BS 2-step RACH requirement | Samsung | Proposal 1: 3 DMRS can be configured for MsgA PUSCH requirementProposal 2: Define the PUSCH mapping type A in FR1 and mapping type B in FR2 for NR 2-step RACH MsgA PUSCH requirement.Proposal 3: 0.8us can be considered as the maximum timing offset for MsgA PUSCHProposal 4: MCS 0 can be selected for requirement with NR step RACH, to fulfill the targeting TBS with 56-72bits Proposal 5: Using BLER 0.1 as the test metric for requirement of MsgA PUSCHObservation 1: Similar BLER performance can be achieved with 2 DMRS and 3 DMRS configurationObservation 2: With small value of TO, the impact on BLER performance of MsgA is minor without TO compensationObservation 3: With TO larger than CP, even with TO compensation operation, large performance degradation is still existedProposal 6: Do not define the requirement with timing offset lager than CP |
| R4-2010783 Further discussion on BS demodulation performance requirements for 2-Step RACH | ZTE | Proposal 1: BS demodulation performance requirements are defined with TO compensationProposal 2: Change the lower end values for medium level TO cycling to 0µs as high level TO cycling. Proposal 3: Scaling X:∆t:Y between two different SCSs for high level TO cycling as medium level TO cyclingProposal 4: Set medium and high level TO cycling values as Table – 4 and Table – 5 respectively.Proposal 5: Specify BS demodulation performance requirements for mapping type A and type B respectively.Proposal 6: Set test metric to BLER 0.1 for BS demodulation performance requirements for 2-step RACH.Proposal 7: Specify BS demodulation performance requirements with DMRS configuration 1+1+1.Proposal 8: Specify BS demodulation performance requirements for 2-step RACH under FRC tables as Table-6 and Table-7 for FR1 and FR2 respectively. |
| R4-2010784 Draft CR for 38.104: Performance requirements for 2-Step RACH | ZTE |  |
| R4-2010785 Simulation results for 2-step RACH BS demodulation requirements | ZTE |  |
| R4-2010842 2-step RACH demodulation requirements | Ericsson | Proposal 1: Adopt option 2 (4 PRB, DM-RS 1+1, 7 symbol for FR1, 5 for FR2)Proposal 2: Include a declaration whether “medium” T0 and associated requirements are supported or alternatively “high” T0 is supported. Only one set of requirements to be applicable/tested depending on declaration.Proposal 3: 1% BLER |
| R4-2010906 2-step RACH BS demodulation simulation results | Nokia |  |
| R4-2010907 On 2-step RACH BS demodulation requirements | Nokia | Proposal 1: RAN4 not to deviate from current PUSCH applicability rules and BS needs to only comply for the mapping type declared to be supported in D.100.Observation 1: Most of the PUSCH performance requirements use SNR at 70% throughput as a test metric, which maps to 30% BLER.Observation 2: Simulation results from previous meetings show significant SNR differences when considering PUSCH performance with uncorrected TO at 10 % BLER and 70 % TPUT [4] [5] [6].Proposal 2: RAN4 for define MsgA PUSCH performance requirements using a 10% BLER metric.Observation 3: High Level TO cycling upper limit for the 30 kHz SCS test case is the most challenging one when compered to the C length.Proposal 3: RAN4 to review the upper limit of the High Level TO cycling for the 30 SCS scenario, and use (X, ∆t, Y) as (0, 0.1, 1.9).Observation 4: Medium TO level ranges and High TO ranges have similar average value.Proposal 4: RAN4 to consider TO ranges starting at zero for Medium and High TO ranges.Observation 5: 2-step RACH demodulation requirements relate mostly to the MsgA PUSCH performance, and has more relation to the existing PUSCH clauses than with the PRACH clauses.Proposal 5: RAN4 to define 2-step RACH demodulation performances as a subclause in the clauses 8.2 for PUSCH requirement in 38.141-1 [4], 38.141-2 [5], and 38.104 [6] as: -TS 38.141-1: 8.2.6 Performance requirements for MsgA PUSCH -TS 38.141-2: 8.2.6 Performance requirements for MsgA PUSCH -TS 38.104: 8.2.6 Requirements for MsgA PUSCH |
| R4-2011009 Discussion and simulation results on NR 2-step RACH BS performance requirements | Huawei | Observation 1: The performance between high level TO and medium TO level is negligible after TO compensation.Observation 2: – For 15kHz, 30kHz and 120kHz SCS, considering TO compensating or not, there is about 1~2dB performance differnece for medium level TO and about 6~7dB performance differnece for high level TO. – For 120kHz SCS, considering TO compensating or not, there is about 3~6dB performance differnece for both medium level TO and high level TO.Proposal 1: Only define high level TO cases for NR 2-step RACH.Proposal 2: Define both Type A and Type B for both FR1 and FR2 for NR 2-step RACH demodulation requirements. Only the mapping type declared to be supported in D.100 shall be tested. If both mapping type A and type B are declared to be supported, the tests shall be done for either type A or type B.Proposal 3: Define 1% BLER for 2-step RACH requirements definition.Proposal 4: Only define DMRS 1+1 for NR 2-step RACH performance definition. |
| R4-2009739 Views on BS demodulation requirements for NR 2-Step RACH | Intel | Proposal #1: Consider Post FFT time offset compensation as a baseline receive processing for requirements definition (i.e. No per UE FFT window adjustment).Proposal #2: Specify MsgA demodulation performance requirements only with medium level TO set.Proposal #3: Specify MsgA demodulation performance requirements with 1+1 DMRS configuration.Proposal #4: During the test update TO error per each RACH preamble + MsgA occasion.Proposal #5: Specify MsgA demodulation performance requirements with 1% BLER metric. |

# Topic #1: Setup for specifying BS demodulation requirements for 2-step RACH

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

## Companies’ contributions summary

## 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

*Sub-topic description: open issues on configurations*

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

**Issue 1-1: DMRS configuration**

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

**Issue 1-2: Mapping type**

* Proposals
	+ Option 1: both mapping type A and B for both FR1 and FR2
	+ Option 2: mapping type A for FR1, and mapping type B for FR2
* Recommended WF
	+ Option 1?

**Issue 1-3: TO compensation**

* Proposals
	+ Option 1: with TO compensation
	+ Option 2: without TO compensation
* Recommended WF
	+ Option 1?

**Issue 1-4: Starting value for medium level TO cycling**

* Proposals
	+ Option 1: set 0 µs as starting value for SCSs for medium level TO cycling
	+ Option 2: keep current starting values
* Recommended WF
	+ Option 1?

**Issue 1-5: Should maximum value for TO cycling be larger than CP?**

* Proposals
	+ Option 1: Yes
	+ Option 2: No
* Recommended WF
	+ Option 1?

**Issue 1-6: Scaling X:∆t:Y with SCSs between 15k and 30k, and between 60k and 120k**

* Proposals
	+ Option 1: Yes
	+ Option 2: No
* Recommended WF
	+ Option 1?

**Issue 1-7: Test metric**

* Proposals
	+ Option 1: BLER = 0.1
	+ Option 2: BLER = 0.01
* Recommended WF
	+ Option 1?

**Issue 1-8: MCS**

* Proposals
	+ Option 1: keep current agreement MCS 1 for FR1 and MCS 3 for FR2
	+ Option 2: set MCS 0 for both FR1 and FR2
* Recommended WF
	+ Option 1?

**Issue 1-9: Combination of number of PRBs and number of symbols**

* Proposals
	+ Option 1: keep current agreement (2 PRBs, 14 symbols) for FR1, and (2 PRBs, 10 symbols) for FR2
	+ Option 2: (4 PRBs,7 symbols) for FR1 and (4 PRBs, 5 symbols) for FR2.
* Recommended WF
	+ Option 1?

**Issue 1-10: Should requirements for both medium and high level TO cycling be defined?**

* Proposals
	+ Option 1: Yes, keep current agreement
	+ Option 2: No, only define requirement for high level TO cycling
	+ Option 3: No, only define requirements for medium level TO cycling
* Recommended WF
	+ Option 1?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1: Sub topic 1-2:….Others: |
| Ericsson | Issue 1-1: In case 5/7 symbols would be selected, then the DM-RS should be 1+1. In case all symbols (i.e. 14/10) are selected, then 1+1+1 may make more sense because, although there is not a large performance difference 1+1+1 is the default configuration and so may be the one more often used.Issue 1-2: For FR2, Rel-15 requirements consider mapping type B only. For FR1, in case fewer than 14 symbols are used then type B may be appropriate. If 14 symbols are used, A or B with an applicability rule is OK.Issue 1-3: Our understanding is that the point of the requirement is to verify that T0 compensation is done properly (so option 1)Issue 1-4: We’re OK to start from 0 (but don’t have a strong view)Issue 1-5: This should be the difference between the “medium” and “high” T0; the “medium” is always within the CP.Issue 1-6: For the “medium” T0; this relates to CP size and should scale with the SCS. For the “high” T0, this relates to largest expected cell size, which does not scale with T0.Issue 1-7: We propose 1% BLER, since 10% probability of needing to go to 4-step RACH seems like 10% of the time missing the point of 2-step, which is rather high.Issue 1-8: No strong view, but depends on the number of PRBs and the numberof symbols. Decide after considering 1-9.Issue 1-9: Our understanding from the previous meeting was that 4 PRB would be associated with using half of the number of symbols (so that the TBS is the same for both 2 and 4 PRBs). Our simulations showed that performance could be better with 4 PRBs and half the symbols. Also, using half the symbols leaves room for T0 whilst avoiding colliding with the next slot. So we see some advantage from using 4 PRB and half the symbols, but we do not have a very strong view and would like to see the issue decided in this meeting. |
|  |  |

### 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:* |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #2: Declaration and test aspects

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

## Companies’ contributions summary

## 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

*Sub-topic description: Declaration item(s) for BS demodulation for 2-step RACH*

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

**Issue 2-1-1: Should be the support of medium or high level TO cycling declared?**

* Proposals
	+ Option 1: Yes, either support of medium or high level TO cycling should be declared
	+ Option 2: Yes, only the support of high level TO cycling should be declared. Support of medium level TO cycling is mandatory
	+ Option 3: Yes, only the support of medium level TO cycling should be declared. Support of high level TO cycling is mandatory
	+ Option 4: No, both medium and high level TO cycling should be mandatory
* Recommended WF
	+ Option 1?

### Sub-topic 2-2

*Sub-topic description: test aspects for BS demodulation for 2-step RACH*

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

**Issue 2-2: Should TO error be updated per each RACH preamble+MsgA occasion during the test?**

* Proposals
	+ Option 1: Yes
	+ Option 2: No
* Recommended WF
	+ Option 1?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 2-1: ….Others: |
| Ericsson | Issue 2-1-1: Our understanding, and looking at results from Intel is that if the T0 is larger than the CP and timing compensation is not done correctly then performance is degraded. If the requirement would be set considering medium T0 only, then that would mean that a BS claiming to cover the whole cell with 2-step RACH could achieve the requirement but have incorrectly implemented timing compensation and have a performance loss outside of the CP area. If on the other hand only the high T0 would be used, then all BS would be forced to implement the timing compensation for high T0, which may include some re-sampling. To ensure correct requirement coverage whilst not forcing any implementation, we think the best approach is to declare whether medium or high T0 is met; i.e. option 1.Issue 2-2: Our understanding is that what is meant is “Apply the same T0 to both PRACH preamble and msgA”. If this is correct, we would like to update the wording of the option for clarity, and can agree with it. |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| 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.*

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #3: CRs

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

## Companies’ contributions summary

## Open issues summary

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

### Sub-topic 3-1

*Sub-topic description: CR for TS 38.104*

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

**Issue 3-1: Add a new section 8.2.6 to capture the requirements of BS demodulation for 2-step RACH in TS 38.104**

* Proposals
	+ Option 1: Yes
	+ Option 2: Other options not precluded
* Recommended WF
	+ Option 1?

### Sub-topic 3-2

*Sub-topic description: CR for TS 38.141-1*

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

**Issue 3-2: Add a new section 8.2.6 to capture the requirement test of BS demodulation for 2-step RACH in TS 38.141-1**

* Proposals
	+ Option 1: Yes
	+ Option 2: Other options not precluded
* Recommended WF
	+ Option 1?

### Sub-topic 3-3

*Sub-topic description: CR for TS 38.141-2*

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

**Issue 3-3: Add a new section 8.2.6 to capture the requirement test of BS demodulation for 2-step RACH in TS 38.141-2**

* Proposals
	+ Option 1: Yes
	+ Option 2: Other options not precluded
* Recommended WF
	+ Option 1?

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 3-1: ….Others: |
| Ericsson | OK to add new sections; should we do a CR split ? (We can volunteer for one CR) |

### 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** |
| R4-2010784 Draft CR for 38.104 | 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.*

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

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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

# Topic #4: Simulation results

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

## Companies’ contributions summary

## Open issues summary

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

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | ….Others: |

### 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:* |

*Suggestion on WF/LS assignment*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

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

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