**3GPP TSG-RAN WG4 Meeting # 99-e R4-211XXXX**

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

**Agenda item:** 10.7

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Email discussion summary for [99-e][333] NR\_ATP

**Document for:** Information

# Introduction

The discussions in this thread includes study on 5G NR UE Application Layer Data Throughput performance requirements.

# Topic #1: TR Structure and Work Split

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2111255 | Qualcomm | Draft CR on RAN4 study on Application Layer Throughput Requirements |

## Open issues summary

### Sub-topic 1-1: TR Structure

**Issue 1-1: TR Structure**

* Proposals
	+ Option 1 (QC):
	+ 5.10 Feasibility of Defining Link Adaptation Absolute Physical Layer Requirements in RAN4
		- 5.10.1 General

The purpose of this clause is to analyse whether it is feasible to define absolute physical layer throughput requirements under link adaptation in RAN4 using link-level simulation results based on the agreed set of simulation assumptions. As part of feasibility study, this clause will also conclude on test methodology which includes:

Alignment criteria for aligning the simulation results across companies and

Methodology to define the final requirements, if it is found to be feasible to define such requirements in RAN4.

* + - 5.10.2 Test Methodology
			* 5.10.2.1 Simulation Alignment Criteria

TBA

* + - 5.10.3 Simulation Assumptions

TBA

* + - 5.10.4 Simulation Results

TBA

* + - 5.10.5 Summary

TBA

* Recommended WF
	+ TBA
		- Discuss this issue first and then draft CR can be revised (if needed) based on the discussion.

### Sub-topic 1-2: CR Work Split

**Issue 1-2: CR Work Split**

|  |  |
| --- | --- |
| **Topic** | **Company** |
| General |  |
| Simulation Alignment Criteria |  |
| Simulation Assumptions |  |
| Simulation Results (Same company will drive the effort for collection of simulation results) |  |
| Summary |  |

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-1: TR Structure****Issue 1-2: CR Work Split** |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| 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 provides recommendation on CRs/TPs Status update*

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

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

## Discussion on 2nd round (if applicable)

# Topic #2: Simulation Results Alignment

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2109362 | Apple | Simulation results and below proposals:Proposal #1: If determined to be feasible, define link adaptation throughout requirements for 2 SNRs – one in rank 1 and one in rank 2 operation SNR range. Proposal #2: Define requirement for minimum absolute throughput at SNR points. Proposal #3: The minimum absolute throughput is derived by multiplying the averaged throughput by Y (%), e.g., Y=95% or 90%. |
| R4-2109464 | Qualcomm | Simulation results and below proposals:Proposal 1: Use 20dB SNR for FR1 and 16dB SNR for FR2 as baseline for studying the feasibility of defining NR link adaptation throughput requirements.  |
| R4-2109996 | Ericsson | Proposal 1: RAN4 shall further discuss which simulation results alignment criteria is more suitable based on companies’ simulation results.Proposal 2: The requirement definition for link adaptation (LA) physical layer throughput shall follow the same criteria in simulation results alignment. |
| R4-2109997 | Ericsson | Simulation results and below proposals:Observation 1: UE reports relatively lower CQI/Rank to achieve lower BLER(10%).Proposal 1: RAN4 not only to align the throughput results but also to consider the reasonable CQI, RI feedback and decoding rate.  |
| R4-2110170 | Intel | Simulation results. |
| R4-2110525 | Huawei, HiSilicon | Observation 1: It seems impractical for BS to schedule PDSCH by following the reported CQI/PMI/RI completely in the actual scenario.Proposal 1: RAN 4 should study and define one OLLA algorithm for BS/instrument for this test.Proposal 2: RAN 4 should further study how to resolve the contradictions between achieving high throughput and feasible BLER (10%). |

## Open issues summary

### Sub-topic 2-1: Ways to Align Simulation Results

Based on simulation results provided in the contributions:

* There are two sets of simulation results:
	+ Qualcomm and Apple’s results align,
	+ Intel and Ericsson’s results align
	+ However, above two sets have a large difference in performance.
* Ericsson’s FR2 throughput results seem too high. Request Ericsson to double check.

In this subtopic, we discuss possible ways to improve the alignment.

**Issue 2-1-1: Accounting for slots not containing grants**

* Proposals
	+ Encourage companies to further check and comment whether they accounted for not scheduling any grant on Special slots and slots containing CSI-RS/TRS when reporting throughput results.
* Recommended WF
	+ TBA

**Issue 2-1-2: Accounting for aperiodic reporting processing delay**

* Proposals
	+ Encourage companies to further check and comment whether they accounted for aperiodic CSI reporting processing delays (FR1 FDD: 6ms, FR1 TDD: 5.5ms, FR2 TDD: 1.375ms) when reporting throughput results.
* Recommended WF
	+ TBA

**Issue 2-1-3: Whether to consider AWGN channel in addition to fading channel to improve alignment**

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

Note: Many carriers have application layer throughput tests for both AWGN and fading channels in LTE.

**Issue 2-1-4: Target BLER**

* Proposals
	+ Option 1: 10%.
* Recommended WF
	+ TBA

Note: Targeting higher BLER may result in increased throughput. However, it may cause UE to fail existing CQI reporting tests.

**Issue 2-1-5: Additional reported metrics**

* Proposals
	+ Option 1: BLER with link adaptation for each SNR point.
	+ Option 2: No additional reported metric.
* Recommended WF
	+ TBA

**Issue 2-1-6: Simulation results alignment criteria**

* Proposals
	+ Option 1: Absolute throughput span within X% of average throughput across companies at a given SNR.
		- Decide X based on simulation results. Possible values of X = [5]% or [10]%.
	+ Option 2: SNR G±Gspan can be reached for the T% of maximum throughput
		- Maximum throughput is derived with TBS corresponding to CQI index 15 with rank 2 for 2Rx/4Rx UE.
		- Decide Gspan based on simulation results. Candidate option is Gspan = [2.5] dB.
* Recommended WF
	+ TBA

### Sub-topic 2-2: Assumptions

**Issue 2-2-1: Whether to consider OLLA algorithm for BS/TE**

* Proposals
	+ Option 1: Yes. (Huawei)
	+ Option 2: No
* Recommended WF
	+ TBA

### Sub-topic 2-3: Requirements Definition

If it is found to be feasible to define absolute throughput requirements, following issues will be considered for defining the requirements.

**Issue 2-3-1: How to set the requirements (if found feasible to define such requirements)**

* Proposals
	+ Set the physical layer throughput requirements by
		- Option 1: Multiplying the averaged throughput by Y (%), e.g., Y=95% or 90%.
		- Option 2: Using methodology from PDSCH demodulation requirements with fixed RMC (i.e. average of impairments results + X dB margin).
* Recommended WF
	+ If Option 1 in Issue 2-1-6 is agreed, use Option 1. If Option 2 in Issue 2-1-6 is agreed, use Option 2.

**Issue 2-3-2: Number of SNR points for defining requirements (if found feasible to define such requirements)**

* Proposals
	+ Option 1: one in rank 1 and one in rank 2 operation SNR range.
	+ Option 2: one in rank 2 operation SNR range.
* Recommended WF
	+ TBA

**Issue 2-3-3: SNR point for defining requirements (if found feasible to define such requirements)**

* Proposals
	+ Option 1: 20dB for FR1, 16dB for FR2. (QC)
	+ Option 2: (14, 22) dB for FR1 2Rx, (4,20) dB for FR1 4Rx, (12,18) dB for FR2. (Apple)
* Recommended WF
	+ TBA

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Sub-topic 2-1: Ways to Align Simulation Results****Issue 2-1-1: Accounting for slots not containing grants****Issue 2-1-2: Accounting for aperiodic reporting processing delay****Issue 2-1-3: Whether to consider AWGN channel in addition to fading channel to improve alignment** **Issue 2-1-4: Target BLER****Issue 2-1-5: Additional reported metrics****Issue 2-1-6: Simulation results alignment criteria****Sub-topic 2-2: Assumptions****Issue 2-2-1: Whether to consider OLLA algorithm for BS/TE****Sub-topic 2-3: Requirements Definition****Issue 2-3-1: How to set the requirements****Issue 2-3-2: Number of SNR points for defining requirements** **Issue 2-3-3: SNR point for defining requirements** |

### 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