3GPP RAN 5G-ACIA Evaluations Week 3

February 22nd – 26th 2021

Source: Moderator (Ericsson)

Title: Review of provided simulation results and needed updates

Document for: Discussion, Decision

# 1 Introduction

AT RAN#89, the following was agreed in [RP-202069](https://protect2.fireeye.com/v1/url?k=41a5db26-1f051960-41a59bbd-86fc6812c361-73f443258ff773bf&q=1&e=bc078f84-983d-45f3-ab31-19e60d911036&u=https%3A%2F%2Fwww.3gpp.org%2Fftp%2Ftsg_ran%2FTSG_RAN%2FTSGR_89e%2FDocs%2FRP-202069.zip) on providing evaluations for 5G-ACIA:

* Start an offline email-based activity to provide evaluation results for 5G-ACIA
* One company volunteers as moderator
  + Proposes a work plan to follow
  + Ericsson is willing do this
* Discussions are on the RAN1\_NR reflector
  + Email activity only during short periods (< week) distributed across the time allocated to the activity
  + No email activity in weeks before/during/after RAN1 meetings or RAN defined inactive periods
  + All companies should strive to limit email activity as much as possible
  + Outcome of the offline discussion will directly go to RAN without need for discussion in RAN1 nor need for LS from RAN1 to RAN
* Target completion by RAN#91
* At RAN#91, RAN will decide on a response LS to 5G-ACIA

The moderator made the following proposal on a timeline:

1. 12-16 October 2020
   * Discussion on which URLLC features to include in the evaluations and simulation assumptions
2. 14-18 December 2020
   * First round of simulation results
3. 22-26 February 2021
   * Second round of simulation results
4. 8-12 March 2021
   * Finalization of the report to RAN#91

During week 1, the simulation assumptions were agreed as captures in the document below:

[https://www.3gpp.org/ftp/tsg\_ran/TSG\_RAN/TSGR\_90e/Inbox/Drafts/5G-ACIA October/Agreements/Agreements week 1 5G-ACIA.docx](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Inbox/Drafts/5G-ACIA%20October/Agreements/Agreements%20week%201%205G-ACIA.docx)

For week 2, companies provided the first round of simulation results. The summary is provided here:

[https://www.3gpp.org/ftp/tsg\_ran/TSG\_RAN/TSGR\_91e/Inbox/Drafts/5G-ACIA%20December/Final Summary/5G-ACIA Week 2 - Final summary.docx](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20December/Final%20Summary/5G-ACIA%20Week%202%20-%20Final%20summary.docx)

For the third week, companies provided the second round of simulation results:

[https://www.3gpp.org/ftp/tsg\_ran/TSG\_RAN/TSGR\_91e/Inbox/Drafts/5G-ACIA February/Company Inputs/](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20December/Company%20Inputs)

The input contributions are also listed in the reference section.

In this contribution, review comments from other companies are collected for each input document.

# 2 Company Inputs

## 2.1 Ericsson

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/Ericsson%205G-ACIA%20Simulation%20Results%20Round2.zip).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | How is it explained that CSA performance is better in UL than in DL?  How is radio link adaptation done? i.e. is there any MCS or PRB change for new packet transmission?  In UL is CG adapted, or is the MCS and PRB allocation constant throughout the simulation?  How is UL OL PC done?  Is the minimum packet delay of ~380 μsec in FR1 a DL or UL packet delay value? What is the UE and gNB processing delay?  Why PER performance is better in UL than in DL at 4GHz?  Why is it the opposite at 30 GHz (DL slightly better than UL)?  Is there the same comparison for 10-5 PER?  Is the minimum packet delay of ~270 μsec in FR2 a DL or UL packet delay value? What is the UE and gNB processing delay? |

## 2.2 Huawei/HiSilicon

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/HwHiSi%20-%20Simulation%20results%20for%205G-ACIA%20in%20the%20second%20round.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | What is the reliability requirement in Table 4 (10-6)?  Is PDCCH modeled? If yes, how? i.e. how many symbols? E.g. how is 20% overhead due to DCI can be justified in a 6D2G6U slot format?  How is the difference in DL-UL performance in terms of PER and CSA in 4GHz explained (better UL, Table 5)?  What is the number of UEs in the factory in Figure 5?  The only difference between (Tables 4 and 6)   * The orthogonal frequency allocation and * SU transmission   With coordination is the resource allocation scheme?  What is the reliability requirement in Table 6 (10-6)?  With regards to Fig. 6, is there an equivalent number for PER 10-5?  What is the lowest SNR achieved by a UE? 1RB may not be sufficient for a UE to achieve 10^-6 error  Why is the loading among gNBs evenly distributed? In our simulation we observe unbalanced loading among gNBs. |

## 2.3 Intel

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/INTEL%20-%205G-ACIA%20LS%20-%20Phase%203%20inputs%20v0.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | No question |

## 2.4 Nokia

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/NOKIA%20-%205G-ACIA%20Final%20round%20of%20simulation%20results.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | It seems that minimum packet delay for both DL and UL is 0.5 ms. What are the assumptions for gNB and UE decoding delays?  Are there simulation results with lower UE numbers & higher reliability (close to 100%)? |

## 2.5 Qualcomm

Contribution links for [FR1](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/QUALCOMM-5G-ACIA_URLLC_simulation_results_2nd_round_FR1.docx) and [FR2](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/Qualcomm5G-ACIA_URLLCsimulationResultsRound1_FR2_version1.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
|  |  |

## 2.6 vivo

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/vivo%20-%205G-ACIA%202nd%20round%20URLLC%20evaluation%20results.zip).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | Supporting 30 UEs without cell coordination and with most of the UEs having BLER < 1e-5 does not seem to be in alignment with results from other companies, especially considering the delay budget in your tables. Could you please share the geometry curve or SINR curves for your setup? How is interference among the UEs mitigated? |

## 2.7 ZTE

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/ZTE-5G-ACIA%20evaluations%20-%202nd%20round%20of%20simulation%20results.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | What is the rationale behind 5 symbols PDSCH?  In the Table A-2 for simulation assumptions for 30 GHz, the carrier frequency is 4 GHz and the SCS is 30 kHZ. It seems that these are the parameters for FR1. |

## 2.8 CATT

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/ZTE-5G-ACIA%20evaluations%20-%202nd%20round%20of%20simulation%20results.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| Qualcomm | What is the minimum DL packet delay value?  What is the UE processing time?  The DL slot duration?  How is radio link adaptation done? i.e. if there is one erroneous packet does something change when a new packet is transmitted? |

## 2.9 ITRI

[Contribution link](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/ZTE-5G-ACIA%20evaluations%20-%202nd%20round%20of%20simulation%20results.docx).

Other companies can provide questions and comments in the table below:

|  |  |
| --- | --- |
| Company | Questions and comments |
| QC | How is it explained that DL is better than UL (contrary to HW, Ericsson)? |

# 3 Conclusions

# References

1. [RP-202069](https://protect2.fireeye.com/v1/url?k=41a5db26-1f051960-41a59bbd-86fc6812c361-73f443258ff773bf&q=1&e=bc078f84-983d-45f3-ab31-19e60d911036&u=https%3A%2F%2Fwww.3gpp.org%2Fftp%2Ftsg_ran%2FTSG_RAN%2FTSGR_89e%2FDocs%2FRP-202069.zip), “Way forward on RAN work for 5G ACIA requested simulations“, Ericsson
2. “[Simulation Results for 5G-ACIA (Second round)](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/Ericsson%205G-ACIA%20Simulation%20Results%20Round2.zip)”, Ericsson
3. “[Simulation results for 5G-ACIA in the second round](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/HwHiSi%20-%20Simulation%20results%20for%205G-ACIA%20in%20the%20second%20round.docx) Huawei, HiSilicon
4. “[5G-ACIA LS – Phase 3 input](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/INTEL%20-%205G-ACIA%20LS%20-%20Phase%203%20inputs%20v0.docx)”, Intel Corporation
5. “[Final round of simulation results for 5G-ACIA evaluation](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/NOKIA%20-%205G-ACIA%20Final%20round%20of%20simulation%20results.docx)”, Nokia, Nokia Shanghai Bell
6. “[Second round of FR1 simulation results for 5G ACIA URLLC LS response](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/QUALCOMM-5G-ACIA_URLLC_simulation_results_2nd_round_FR1.docx)”, Qualcomm CDMA Technologies
7. “[Simulation Assumptions and URLLC Performance Evaluations for 5G-ACIA Performance Evaluation Round 1](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/Qualcomm5G-ACIA_URLLCsimulationResultsRound1_FR2_version1.docx)(FR2)”, Qualcomm CDMA Technologies
8. “[5G-ACIA 2nd round URLLC evaluation results](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/vivo%20-%205G-ACIA%202nd%20round%20URLLC%20evaluation%20results.zip)”, vivo
9. “[5G-ACIA evaluations - 2nd round of simulation results](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_91e/Inbox/Drafts/5G-ACIA%20February/Company%20Inputs/ZTE-5G-ACIA%20evaluations%20-%202nd%20round%20of%20simulation%20results.docx)”, ZTE