**3GPP TSG-RAN WG2 #126 *R2-24xxxxx***

**Fukuoka Japan May 20th – 24th, 2024**

Agenda Item: 8.3.2.1

Source: OPPO(Rapporteur)

Title: Summary of [POST126][031][AIMob] Simulations (OPPO)

Document for: Discussion, Decision

# Introduction

This the summary of following post email discussion:

* [POST126][031][AIMob] Simulations (Oppo)

Intended outcome: Agree to evaluation documentation and small simulation related FFS (needed to start simulation evaluation for August meeting)

Endorse Skeleton TR

Deadline: short

|  |  |  |
| --- | --- | --- |
| Company | Delegate | Email address |
| NTT DOCOMO | Xin Wang | wangx@docomolabs-beijing.com.cn |
| Ericsson | Cecilia Eklöf | cecilia.eklof@ericsson.com |
| Samsung | Taeseop Lee | taeseop.lee@samsung.com |

# Discussion

## Simulation report template

It is expected simulation result on RRM measurement use case will be submitted to RAN2#127 meeting for further evaluation after the summer. In order to document simulation results reported by each company, a report template is necessary to be aligned among companies. In RAN2#126, contributions [1] and [2] proposed their understanding of how such a template can be. Table 1 lists the parameters based on agreements made so far.

|  |  |  |  |
| --- | --- | --- | --- |
| Report parameters | | **Company A** | **……** |
| Reported simulation assumptions | UE trajectory option (option 1,2,3 in[4]) |  |  |
| UE trajectory boundary processing option (option 1,2,3 in[4]) |  |  |
| UE speed (30,60,90,120 Km/h) |  |  |
| Inter-frequency correlation assumption in general (yes or no)(Note 1) |  |  |
| Measurement reduction rate(50%,…Note2) |  |  |
| Prediction window (?ms,… Note 3) |  |  |
| Any other parameters (Note 4) |  |  |
| Data Size (Sample number) | Training/validity |  |  |
| Testing |  |  |
| AI/ML model  input/output | Model input (Note 5) |  |  |
| Model output |  |  |
| AI/ML model description | Model type (e.g., LSTM, CNN, transformer …) |  |  |
| Model complexity in a number of parameters(M) |  |  |
| Model complexity in model size (e.g. Mbyte) |  |  |
| Computational complexity [FLOPs] |  |  |
| Metrics | Average L3 cell level RSRP difference (dBm) |  |  |
| Other optional KPIs (e.g., L1 beam level RSRP difference,) |  |  |
| ... | ... |  |  |

Table 1

*Note1: Only applicable for FR1 to FR1 inter-frequency prediction. It should be N/A, if not applicable*

*Note2: Only applicable for intra-frequency prediction, either temporal domain case B or spatial domain. It should be N/A, if not applicable*

*Note3: Only applicable for intra-frequency temporal domain case A. It should be N/A, if not applicable*

*Note4: This could be any other parameter e.g.,* *Inter-frequency shadow fading correction (e.g. full, partial, no),* *Number of configured beams, observation window(ms) etc.*

*Note5: Apart from input of RRM sub case 1,2,3, any other input e.g. L1 filtering for L1 beam measurement, UE location are also captured here*

For prediction window, companies seem to be fine to align at least one value. And up to submitted simulation result, it is open for modification in RAN2#127 meeting. During [AT126][030][AIMob] discussion people seems to agree with rapporteur that it should be multiple times of sample period. Considering the FR1 and FR2 channel will be quite different and agreed sample period is also different, we’d better assume different prediction window for them also.

Question 1: What value(s) do you recommend for prediction window for RRM measurement use case for FR1 and FR2 respectively?

|  |  |
| --- | --- |
| Company | comments |
| NTT DOCOMO | We suggest using the value N\*Measurement Period, where the Measurement Period is decided by the following table (Table 3). Considering the time span of the whole HO procedure, we suggest at least considering a long prediction window case to check the capability of AI/ML, e.g., N=5. |
| Ericsson | Agree with DOCOMO (e.g. max value of N=5). |
| Samsung | Considering that the RRM prediction results can be used to prepare the HO in advance, the length of prediction window needs to be aligned with the typical HO preparation time (e.g., 40 ~ 60msec) between source/target gNB. Too long prediction window may need to be considered later.  Our recommendation is   * FR1: 40ms or 80ms (1x or 2x sample period) * FR2: 40ms or 60ms (2x or 3x sample period) |

Question 2: Apart from parameters listed in Table 1, what other parameter(s) need be reported? If yes, please provide detail parameter, corresponding description and justification.

|  |  |
| --- | --- |
| Company | comments |
| Ericsson | Historical observation window length (for L1 measurements) for frequency and temporal prediction. It would be good the companies provide the information about the observation window length. It can be defined as the number of samples used as input to the model. |
|  |  |

Question 3: For parameters in Table 1, any further comments?

|  |  |
| --- | --- |
| Company | comments |
| NTT DOCOMO | For AI/ML input and output entry in Table 1, we suggest adding a note that information about the cluster-based approach, including the numbers of input and output cells and their relations, can be reported there to capture the agreements on the cluster-based approach during the last meeting.  Regarding complexity, we suggest reporting the per-cell values for the cluster-based approach since the per-cell approach may require the model to run multiple times to generate the prediction for all cells concerned. For a fair comparison, the normalized value with respect to the output cell number should be reported. |
| Ericsson | Agree with DOCOMO. |
| Samsung | Agree with NTT DOCOMO |

## RRC parameters

Few parameters are left not agreed during [AT126][030][AIMob] discussion as following:

|  |  |
| --- | --- |
| L3 filtering parameter for both FR1 and FR2 | Recommended value |
| FR1 FilterCoefficient | 4 |
| FR2 FilterCoefficient(Note 6) | 4 |

Table 2

|  |  |
| --- | --- |
| Measurement period | Recommended value |
| FR1 to FR1 intra-frequency w.o. gap | 200ms |
| FR1 to FR1 inter-frequency with gap | 120ms |
| FR2 to FR2 intra-frequency w.o. gap | 480ms |

Table 3

|  |  |
| --- | --- |
| Consolidation parameter | Recommended value |
| nrofSS-BlocksToAverage for FR1 | 1 |
| nrofSS-BlocksToAverage for FR2 | 3 |
| absThreshSS-BlocksConsolidation for FR1(Note 7) | -156dbm[2] |
| absThreshSS-BlocksConsolidation for FR2(Note 7) | -156dbm[2] |

Table 4

*Note 6,7: These two parameters are added by rapporteur in case they could be different between FR1 and FR2*

*Note 7: the recommended value from [2] is just for discussion purpose.*

If you have better recommendation, please provide your value(s):

|  |  |
| --- | --- |
| Company | Recommended values |
| NTT DOCOMO | For the measurement period of FR1-to-FR1 inter-frequency with gap (in Table 3), there is no 120ms configuration for the measurement gap repetition period (MGRP) in TS38.331. Although the measurement period does not mean the same value should be used for MGRP, we think it is beneficial for the future study (e.g., monitoring, data collection, etc) if an aligned value can be adopted. Therefore, we suggest using 160ms, which is also closer to the value we used for cases w/o MG.  We are fine with other parameters. |
| Ericsson | We are fine with the proposed values. |
| Samsung | -156 dBm of absThreshSS-BlocksConsolidation is too small to measure in our view. The main scenario of this measurement and prediction is mobility-related decision e.g. handover. absThreshSS-BlocksConsolidation should be a typical value indicating the cell could be a serving cell. The exact value could be different between frequencies. But we prefer a common threshold for both FR1 and FR2. Our recommendation of absThreshSS-BlocksConsolidation is -100 dBm or similar value.  We prefer to have a common measurement period if possible. 200ms can be used for both intra- and inter-frequency scenarios. For FR2, we may use the minimum value (400ms), similar to FR1. |

## TR skeleton

Please provide your comments directly on TR skeleton [3] in the email discussion folder **without** changing original text.

# Reference

1. R2-2404485, Simulation based evaluation of AIML aided mobility, Ericsson
2. R2-2404713, Discussion on simulation assumption of RRM measurement, OPPO
3. R2-2405693 TR 38.744 Skeleton of AI mobility NR OPPO draft TR Rel-19 38.744 0.0.1 FS\_NR\_AIML\_Mob
4. R2-2405941 Summary of [POST125bis][021][AIML mobility ] Simulation assumptions and methodology OPPO discussion Rel-19 FS\_NR\_AIML\_Mob Late