



ATRIUM-854575

**The PSA - Software-hardware zoom meeting was organized on Wednesday the 7th of June at 10 AM (Paris time) by zoom**

**Present : Laura H.B, Olivier S., Guillaume B., Jeremie D., Andres G., Joa L., Fraser H., Begona Q., Vincent L. , Waely, Emmanuel C.**

The goal of the meeting was introduced by EC. It was reminded that the Project Definition (PD), for the PSA, was written with the objective of reaching a minimum of 10kHz on-line PSA per crystal. This statement was reinforced during a recent meeting dedicated to the future IT infrastructure. As a consequence, the PD budget was estimated with 2 servers per capsule leading to the overall 915k€ investment for workstation. In parallel, several R&D on alternative architectures were proposed in the PD.

During the IT meeting Guillaume B. gave an overview of the studies lead in France with the new generation of servers having a significant gain in performances. He demonstrated that we are approaching the 10 kHz PSA / crystal with the Phase 2 emulators using AGATA data and the technology choosen for the first stage of the Phase 2 data flow (server and SQM) using 1 or 0.5 server per crystal. This is very encouraging. It sounds that the need for 2 workstations per crystal is not for the moment a priority.

The Guillaume's studies are using the existing /standard PSA of AGATA. The PD pointed the need to work on the algorithm to take into account the 2 hits/segment problem. A more complex PSA algorithm to treat these events will impact on the performances. We must admit that we don't really know the status of this development. Therefore we need to understand where we are with the R&D on the upgrade of the present PSA algorithm for an online use in the 2-3 next years. This is the responsibility of the PSA team. Fraser H. gave some perspectives at the last AGATA using GPU and/or ML.

Such option is changing the final cost of the infrastructure. The GPU (expensive option) was therefore discussed. To our opinion the development is not yet mature to say if we move the current PSA algo into GPU or change to a ML - GPU approach in 2-3 years. – To be debated during this meeting.

The meeting was basically a round table with the different actors of the PSA in AGATA.

#### Activities in Lyon:

Using the data recorded at the Strasbourg scanning table, the team is setting a Machin Learning method to construct a 3D basis for the PSA. The open questions are : is this a faster way to create a basis ? Does it improve the PSA ?

It was stressed that to validate an improvement of the PSA one should agree on a common in-beam data used by all R&D to allow comparison.

The Lyon's team underlined that a data set from GANIL using fission at VAMOS coupled to AGATA is available freely for benchmarking.

➔ Action on making this data set “easily” accessible in the femul framework

G. Beaulieu presented his R&D using the existing PSA of AGATA but using different architecture

What Guillaume demonstrated is that we are approaching the 10 kHz PSA / crystal with the Phase 2 emulators using AGATA data and the technology chosen for the first stage of the Phase 2 data flow (server and SQM) using 1 or 0.5 server per crystal. This is very encouraging. It sounds that the need for 2 workstations per crystal is not for the moment a priority. With one C6400 server, the current PSA can process 10 kHz at 12 threads. With 2 full PSA chain on one C6400, with 12 threads each, 8.3 + 9.5 kHz are reached. For one PSA flow splitted in 3 (4) PSA processes, with 12 threads, 19 kHz (28 kHz) PSA are reached respectively.

1- The present studies of Guillaume are using the existing /standard PSA. The PD pointed the need to work on the algorithm to take into account the 2 hits/segment problem. A more complex PSA algorithm will impact on the performances. We must admit that we don't really know the status of this development.

2- The GPU (expensive option) was discussed. More work is needed to see if it is relevant. The development is not yet mature to say if we move the current PSA algo into GPU or change to a ML - GPU approach. We agree that it is premature to quote.

3- Guillaume has demonstrated that one can gain in performances using "alternative" data flow path. This recalls one option discussed since a long time which is to change from a STARE->Server+PSA architecture to a STARE -> LoadBalancing layer using servers -> "PSA cloud using CPU; GPU or CPU/GPU". The later is compatible with point #2 for the long term.

#### Activities in Orsay:

Joa L. shown the recent result on the bases calculated using the AGATAGeFEM package. The results of the PSA seem better than ADL. Other developments were presented with the use into the flow of the true  $\chi^2$  and errors on the  $\Delta T_0$ . No improvement is reported.

Another activity is the optimization of the existing PSA by Vincent L. team. This investigation focused on the accuracy type, modern vectorization and format. This task is almost completed and could be integrated in the main git branch of AGAPRO.

→ Action on IJClab's physicist to connect the team to the IP2I team to benchmark and integrate.

#### Activities in Liverpool:

Laura H. describes the Liverpool activities. The activity is presently funded by a grant finishing beginning of 2024. 2 main deliverables are on track : by end of 2023, the integration of the

multiple hit interaction per segment algorithm into the AGAPRO package, test and validations ; Production of a self-calibration basis based on ML.

The multiple hit algorithm has been extensively tested on AGATA data. Studies continues and it is relevant now to benchmark on in-beam AGATA data.

Activities in Salamanca:

Begona Q. made a presentation of the newly commissioned scanning table of Salamanca. Data analysis is on-going.

**The following ACTIONS have been set :**

Improved PSA from IJClab	<ul style="list-style-type: none"> <li>- Check the level of completion and readiness</li> <li>- Push the IJCLab upgraded code on a dedicated git available to the team</li> <li>- Benchmarking and push into the main branch of AGAPRO</li> </ul>	<p>IJCLab (Vincent et al) + IP2I (Olivier S. et al)</p> <p>IJClab (Vincent et al)</p> <p>IP2I (Olivier S. et al)</p>	<p>Christmas 2023</p>
Multiple Hit Algorithm	<ul style="list-style-type: none"> <li>- Final test into femul and AGAPRO at Liverpool</li> <li>- Push the Liverpool release on a dedicated git available to the team</li> <li>- Benchmark into AGAPRO main git AGATA</li> </ul>	<ul style="list-style-type: none"> <li>- Fraser H (Liverpool)</li> <li>- Fraser H (Liverpool)</li> <li>- Olivier S. et al (Liverpool)</li> </ul>	<p>Early 2024</p> <p>Early 2024</p> <p>End of 2024 – beginning of 2025</p>
Uncertainties in the data flow	<ul style="list-style-type: none"> <li>- To be detailed</li> </ul>	<p>?</p>	<p>?</p>

A general comment is that developments made in the framework of AGATA should be made at some point available to the PSA team via git repository. This includes standard PSA, Multiple Hit Algorithms and ML /AI activities.

Minutes prepared by EC.