

## **Minutes of the meeting of SPIRAL2 Scientific Advisory Committee held (partly jointly with GANIL Scientific Council) at GANIL on January 29<sup>th</sup> & 30<sup>th</sup>, 2009**

**Present:** N. Alamanos, B. Blank, G. De Angelis, W. Gelletly, D. Guillemaud-Mueller, M.N. Harakeh (Chair), W. Henning, B. Jonson, W. Mittag, T. Motobayashi, D. Vernhet; ex-officio: S. Galès, M. Jacquemet, M. Lewitowicz

**Absent with notification:** F. Iachello, H. Stöcker

The SPIRAL2 SAC met on January 29<sup>th</sup> & 30<sup>th</sup> at GANIL, partially during the SPIRAL2 Week, which was organised in the period January 26-29, 2009. Joint sessions between SPIRAL2 SAC and GANIL Scientific Council were held during these two days.

### **Closed session**

The SAC was very much impressed by the important progress made in the SPIRAL2 project and the various instrumentation projects related to it. The management has presented its timeline regarding the accomplishment of the various stages of the SPIRAL2 project as well as the safety issues that have to be resolved in order to ensure a smooth execution of the project. The SAC would like to congratulate the management and all technical groups on their achievements. The SAC took note as well of the decision to work with only one red zone and endorsed the arguments that led to that decision. Furthermore, the SAC felt that the progress made reflected on the scientific community. The SPIRAL2 week gave an impression of a vibrant community working enthusiastically and coherently to accomplish the scientific and technical goals.

### **Evaluation of the technical proposals and status reports:**

**GASPARD** preliminary technical proposal:

The LOI for the GASPARD array was submitted to the SAC in 2006. The proposed array would certainly be one of the key components in the experimental programme at SPIRAL2, both in the initial phase and in the period of full running of SPIRAL2. The present technical proposal is, as the collaboration states, in a very early stage and much work is needed before a final technical proposal can be presented. The SAC was, however, very pleased with the presentation made and can give some general comments and recommendations at this stage.

- 1- It is clear that a device with an increase in resolution of a factor 10 and with seven times better efficiency than MUST2 and TIARA would be essential for the physics programme at SPIRAL2.
- 2- The mentioned decoupling of the Si array from the gamma detection and instead a collaborative effort with the PARIS array seems as an excellent use of the available resources. A clear discussion of how the synergy with PARIS should be achieved should be done with high priority.
- 3- The collaboration is encouraged to perform detailed simulations of the need for spatial coverage. It was not clear for the SAC that a full  $4\pi$  system is needed, at least not in the initial phase. Therefore, it is important to study concrete examples including full simulations. Furthermore, the choice of the final geometry based on these simulations should be made in close consultation with the PARIS collaboration to ensure complete synergy of the geometries.

4- The possible joint effort on the electronics side, together with PARIS and FAZIA and with groups from CERN and GSI should be looked into.

5- The incorporation of the new target from Saclay in the GASPARD design should also be addressed in the final proposal.

6- The SAC would also like to see a better-defined management of the GASPARD project. A strong leadership is needed for the collaboration on this important part of the future instrumentation at SPIRAL2.

7- Even if the physics possibilities were clear, the SAC would like to see a more detailed programme, as for example given in the PARIS proposal. The SAC proposes that the collaboration defines their strategic plan with high priority. This should include the physics possibilities where the advantages of the GASPARD performance over that of MUST2 should be addressed. The early experimental programme, including a hint of the “day-one” experiment, as well as the long-term physics programme, in the spirit of GANIL2015, should be discussed.

#### **Neutrons for science (NFS) status report:**

The proposal concerns the direct use of neutrons produced in the breakup of deuterons from LINAG on a target. The physics case concerns the use of the neutrons for a variety of subjects ranging from fundamental questions to more applied measurements.

The SAC is very impressed by the response of the collaboration leading to the continuing improvement of the technical proposal on the three following subjects: neutron transport calculation for the design of the facility, a production source for low-energy neutrons and the development of a detector for the neutron beam monitoring.

The SAC notes with satisfaction the increased number of physicists signing the technical proposal. The scientific programme was also extended, since some physicists from the CIMAP (Caen) have joined the NFS collaboration in order to perform material irradiations in the converter room.

The SAC stresses that the problem of the decay heat evaluation for reactors should be addressed more deeply within the Spain- CENBG collaboration.

#### **PARIS preliminary technical proposal:**

The SAC is impressed by the well-organised collaboration, which has a clear management structure. The SAC further noted with satisfaction the progress made with the simulations of the PARIS detector. Several geometries have been worked out, and it appears that the collaboration is set to finalise the design after some tests of LaBr<sub>3</sub> prototype detectors have been made.

The SAC is also pleased by the ongoing discussion with the GASPARD collaboration, which has already produced synergies between the two detector designs. This is in line with the SAC recommendations made in the previous report. This has led the GASPARD collaboration to keep only the inner Si-ball for detection of charged particles and rely on the PARIS (AGATA) detector to detect the  $\gamma$ -rays. The SAC would like to make the following recommendations:

1- The PARIS collaboration should finalise the simulations and choose the final geometry in close consultation with the GASPARD collaboration to ensure complete synergy of the geometries.

2- Both PARIS and GASPARD collaborations need to develop their electronics and therefore this necessary further development should be pursued jointly by both collaborations aiming at synergies where possible.

3- The PARIS collaboration should present in the next status report the programme focussed at SPIRAL2 (and not the full PARIS programme), i.e. the most important topics for SPIRAL2

Physics with PARIS, with a worked out physics case for “day-one” experiment with SPIRAL2.

**S3** status report:

The SAC was impressed by the progress made in the design of the building and in the optics calculations for the S3 spectrometer. The higher order aberrations seem to be under control with the help of the multipole corrections incorporated in the Q-poles. The general layout has still several options that will be studied and compared in the near future. The fact that the aberrations are under control should allow further optimisation of the optical solution, finalising the layout shortly and presenting it to the next SPIRAL2-SAC meeting. However, extension of the region near the intermediate focal point (i.e. more space) is necessary to accommodate other detectors (e.g. PARIS and AGATA) and should be taken into careful consideration when finalising the design and layout.

The SAC recommends that one general solution be found for the low-energy branch of S3. In addition, possible modifications of S3 between experiments, such as interchanging electrostatic and magnetic components should be investigated in terms of feasibility and costs. A point of concern is the Z resolution and separation which seems to be an issue in particular for the study of N=Z nuclei.

As S3 is one of the first instruments to receive beam from SPIRAL2, the collaboration is asked to update in each report the schedule for the construction, installation and commissioning of S3. In that respect, the collaboration is encouraged to apply soon for funds related to the construction phase of S3.

**EXOAM2** technical proposal:

The EXOGAM2 technical proposal concerns the renewal of the electronics for the current EXOGAM array. Using a new scheme of pulse processing including digital-electronics technology, which is based on developments realised for AGATA, higher counting-rate capabilities and better spatial resolution can be achieved. It was also emphasised that the current electronics for EXOGAM is based on modules that cannot be commercially supported anymore. Detailed design of the electronics was reported as well as budgetary and human resources necessary for the project

The SAC recognises the importance of high-resolution gamma-ray spectroscopy with a Ge detector array for the scientific programme of SPIRAL2, and consequently the need for a dedicated Ge detector array that is permanently stationed at GANIL since the AGATA array will only be there for a limited time. Therefore, the SAC supports the completion of the EXOGAM2 project. The SAC is aware that such development improves especially the high counting-rate performance, which is already a limiting factor of EXOGAM in its present use at GANIL. The improvement on the Doppler-shift correction is expected to be marginal due to the limited improvement on the position resolution.

The SAC is concerned regarding the resources requested for the development and in particular on the need for newly developed electronics. The SAC urges the collaboration to consider options requiring lower investment costs as well as lower human resources compared with the quoted number of 400 person-months. In view of the limited GANIL resources, further extension of the collaboration to support the EXOGAM2 development should also be considered and a clear position with respect to the funding scheme should be developed. The SAC recommends that the efforts of the collaboration to establish an overall strategy of research using EXOGAM2 and AGATA for their use in actual experiments at SPIRAL2 should continue, as has been recommended by the SAC earlier.

**ACTAR** status report:

The SAC finds LOI 15, Direct and Resonant Reactions with an Active Target (ACTAR), submitted in 2006 a relevant part of the physics programme of SPIRAL2. The SAC appreciated the presentation of the status report of the collaboration. Here, a few remarks and recommendations can be made:

- 1- The SAC members are very much impressed by the progress of the collaboration made, among others, within the FP6 ACTAR JRA in particular for what concerns the new generation of active targets.
- 2- The SAC members are very satisfied with the strategy adopted regarding the development of the electronics, which seems to be well elaborated within the ANR application.
- 3- The SAC would appreciate that the collaboration pushes the limitation of the device in terms of counting rate up to  $10^6$  particles per second.
- 4- The collaboration is also encouraged to finalise the simulations for the specific solutions to be used at SPIRAL2 and to set rapidly a plan to get funds for the construction of the detector.

The **DESIR facility** technical proposal:

The SAC was very pleased to see the real and continuing progress made by the DESIR collaboration. This is a large and truly international collaboration. It has overall an ambitious broad programme to be fulfilled by building a large suite of instruments designed to exploit the range of low energy beams, which will be made available from SPIRAL2 and from the S3 separator/spectrometer. The collaboration should maintain its close contact with the SPIRAL2 team to ensure that their needs as far as beams and their intensities and hence the planning for SPIRAL2 are properly matched. They should also concentrate on ensuring that the impressive suite of instruments is fully funded and supported. Finally, the SAC would like to see the collaboration focusing on the experiments, which will be unique to SPIRAL2, and on “day-one” experiments, which will announce the successful early operation of the overall facility. It should be noted that the SAC understands that DESIR will overlap with facilities such as ISOLDE and that healthy competition will also be important in some cases, e.g. some precision measurements, where both facilities can be employed.

**FAZIA** status report:

The FAZIA collaboration presented a status report at the SPIRAL2 SAC meeting. The report includes new experimental results and a discussion of the concerns raised by the SAC in its session of June 10<sup>th</sup>, 2008.

The SAC acknowledges the progress made concerning the study of the doping uniformity of the silicon crystals (a good detector presents a non-uniformity of 1%), in the study of pulse shape analysis for ions up to  $Z=16$  and in the understanding of the influence of the Si uniformity and channelling problems on the Z and A resolution.

The SAC is pleased to learn that new beam time has been requested at the LNS in order to extend this study to ions with  $Z>16$ .

Some questions should be answered by the collaboration in the near future:

- 1- The collaboration, in response to the preceding SAC remarks, showed that they are aware of the fact that there may be great sensitivity to radiation damage, especially at zero and ninety degrees. This will be tested in a beam-time already allocated at Legnaro for this year.

The results in comparison with expected integrated count rates should be presented in the next SAC meeting.

2- Following the results shown and taking into account the fact that a good detector should present a uniformity of 1% the SAC would like to be informed on the strategy of the collaboration for mass production of high quality crystals.

3- Although the SAC understands that FAZIA is a R&D initiative that addresses a broad physics programme, the progress of which may profit many other experimental devices using silicon detectors, the SAC would like to be informed concerning the physics programme to be pursued by the collaboration especially with SPIRAL2. This is necessary considering that the main physics case of FAZIA is related to the energy range exceeding the range of SPIRAL2.

**Other issues:**

Contacts established with NFS and S3 for interdisciplinary research are acknowledged. The status reports on these issues should be included in the reports on NFS and S3.

Next meeting is proposed on September 11<sup>th</sup> at Giens during Colloque GANIL

Topics: day-one experiments with Phase 1, theory involvement in the SPIRAL2 project.