

The workshop took place at the IPHC between May 27 and 29, 2024.

This year, the GDR SCIPAC (<https://scipac.in2p3.fr/>), through the “Heavy ion accelerators” axis, joined this workshop. The first session of the workshop focused on the production of stable and radioactive beams, as well as the acceleration for the production of beams for nuclear physics.

All the presentations are available on the indico website

<https://indico.ijclab.in2p3.fr/event/10376/>.

There were 54 participants registered, including 40 people in person at the IPHC. The workshop was divided into 4 sessions:

- Production of heavy ions (GDR SCIPAC) / Chairwoman: Maud Baylac
- Theory Session / Chairman: François Didierjean
- Beta spectroscopy session / Chairman: Stéphane Grévy
- Fundamental interactions and traps session / Chairmen: Bertram Blank and Antoine de Roubin
- Laser spectroscopy session / Chairman: François Le Blanc

Session Production of heavy ions (GDR SCIPAC)

Regarding the general presentation of the GDR SCIPAC, M. Baylac indicated that significant work is being done to provide a very complete website, allowing access to all the important information concerning accelerator activities. For now, the GDR SCIPAC is being developed on a national scale, but later it could expand to an international scale.

The invited presentation by B. Jacquot showed the evolution of major radioactive ion production accelerators in Europe and worldwide. It should be noted that the machines are regularly upgraded to improve performance in terms of intensity and energy (RIBF) with innovative technological developments. He also presented the issue of beam sharing produced by different accelerators on the same site. He wishes to discuss this topic with other laboratories. This is an important issue to meet the needs of industrial applications, which are particularly important for all facilities. During this presentation, cross-cutting themes relevant to the GDR SCIPAC were presented:

- Maintaining critical skills (creating/maintaining a training program (Master Gd Instrument, accelerator option, training period))
- Communication (help attract new talent, obtain a new R&D budget, secure new positions...)
- Improving the sustainability of our activities (using less energy, increasing societal applications (pollution, climate, space industry))
- Improving the beam time/budget ratio (issue related to optimizing beam sharing)

- Developing societal applications (space, medical applications, ...)

The discussion at the end of the session began with the human resources needed at GANIL for the commissioning of S3 and DESIR. Should we follow the ISOLDE model, which is based on a large number of PhD students and postdocs who stay on site for an average of 2-3 years? The so-called "ISOL" physics creates a closer link between engineers and physicists, so the profiles are therefore broader. To increase the attractiveness of young experts, it might be important to establish a more English-speaking work environment. Of course, salaries and the scheduling of competitive beam time must also be considered to attract more people from abroad. There is also a work model to be established between GANIL and other French laboratories to facilitate exchanges. Involvement in Master's teaching (there is already the M2 PLATO large facilities at Orsay and JUAS in Grenoble) as well as at the L3 Pro DU2I level in apprenticeship is also necessary. This will increase GANIL's visibility among French students.

Regarding upcoming meetings related to DESIR/S3-LEB, it would be relevant to group them with the ISOL-France workshops.

Next year, a workshop focused on the production of radioactive beams produced by SPIRAL1 will be scheduled (organized by P. Delahaye). The Letters of Intent for the first experiments at DESIR linked to the beams produced by SPIRAL1 and S3 will also be scheduled in 2025. DESIR operation will start with the commissioning of the different set-ups before routine operation begins. These events can have points of convergence with the GDR SCIPAC (which also has potential exchange interests with the ALTO community). It would be particularly interesting to identify the interest in simulations of sources and accelerators.

Decay Spectroscopy Session

Before the decay session, the invited speaker F. Nowacki gave an overview on shell-model calculations untitled "From Iol (Island of Inversion) to Iol" along $N=40$ with emphasis on $80Zr$ and $61-64Cr$.

Some initial discussions took place regarding the status of Ge detectors for decay spectroscopy experiments in France. The existing "pool" is starting to degrade, and many of the proposed setups for SPIRAL2 rely on EXOGAM detectors, whose availability may become a limiting factor. The community would benefit from purchasing new Ge detectors. The issue of funding was raised, noting that the price of a detector can exceed 120 k€. One potential source of funding mentioned was the TGIR GANIL, although the feasibility of this was not commented on.

Funding requests (ANR) as part of an ambitious decay station project for DESIR were also mentioned, which would allow for the inclusion of other detectors (e.g., for conversion electrons). Recently, researchers from the United Kingdom have also expressed interest in getting involved with ambitious projects at GANIL. Purchasing detectors is a potential contribution they could make.

Trap and Fundamental Interaction Session

This session was split into two parts: fundamental interactions and mass spectrometry.

An overview talk about tests of the weak interaction at low energy was given by N. Severijns.

Discussion:

- the upcoming session of the IN2P3 Scientific Council (SC) focused on “High precision tests of fundamental interactions at low energy” was brought up. The session is scheduled on Monday June 24 and Tuesday June 25 2024. The following projects will be reviewed: bSTILED, MORA, WISArD, ASCARD, n2EDM, GBAR and COMET. (see <https://indico.in2p3.fr/event/32648/>). The needs for HR for DESIR is discussed and will have to be stressed to the IN2P3 SC. The question about financial support is also discussed, particularly focusing on the help that the Région Normandie could bring.
- Positions of setups in the DESIR hall
 - CRIS could benefit from a Penning trap system downstream, so MLLTRAP could move to the end of the DESIR hall. This would allow to use beams cleaned through the CRIS-like set-up. The space freed by MLLTrap could be used to install a new set-up dedicated to sympathetic cooling, which would be of interest for CRIS and other set-ups in the DESIR hall.
 - Ultra-cold ions (by laser or sympathetic cooling) would be interesting for many experiments so this setup should be placed close to the entrance. Two options: either on the MR-ToF/PIPERADE side or instead of MLLTRAP. Will it be on a HV platform? The question whether the development of such a setup is of high priority was raised.
 - CRIS would be in the middle of the hall
 - Question whether MORA needs purification from Penning traps. If HRS and MR-ToF are sufficient, then MORA’s position stays the same, otherwise it could move on the opposite side of CRIS.
 - All these questions will be clarified and finalised in the next months by the DESIR community.

Laser Spectroscopy Session

During the invited presentation by S. Raeder, the latest results in laser spectroscopy in the super-heavy region were presented.

In the discussion session, the LINO project was predominantly discussed. The status of this project remains unchanged; it is still located at ALTO and consists of an entry quadrupole triplet, a set of electrostatic lenses for velocity tuning, a charge-exchange cell to neutralize atoms, and a detection chamber (towards a PMT). Restarting LINO at ALTO would require a full year of preparation. Therefore, testing LINO with a stable beam at ALTO could only occur in 2026 (and still without RFQCB). It appears more strategic to prepare the offline commissioning of LINO in DESIR. The building is expected to be completed by late 2025, including the laser room. Thus, LINO could be relocated to DESIR between October 2025 and

September 2026. There are several ways to utilize LINO in the DESIR hall, either in CRIS mode but without nuclear orientation. During the discussion, it was not possible to identify interested communities in France for laser polarization. For the CRIS (Collinear Resonance Ionisation Spectroscopy) part, a laser/atom interaction chamber, a time-of-flight, and a detection chamber with retractable diagnostics are required. The estimated cost to add these to LINO is approximately 1M€ (500k€ for the line and 500k€ for lasers). This option appears to meet the current demand of the community. The LUMIERE line will thus be a LINO in CRIS-Like configuration. In phase 0, LINO will be installed and tested as done at ALTO but utilizing bunched beam from GPIB. It will therefore be commissioned in collinear mode with fluorescence detection. It will be necessary to purchase a Matisse laser (high-resolution tunable laser) and a new electrostatic bender with its chamber. Estimated price to get LINO operational in DESIR in phase 0 is 200k€.

An online European-scale meeting via Zoom is scheduled for July 2nd with the emerging community around LUMIERE.

ISOL-France board members:

Last term :

- Pauline Ascher (LP2iB)
- Lucia Caceres (GANIL)
- François Didierjean (IPHC)
- Enrique Minaya Ramirez (IJCLab)

Next term :

- Sarina Geldhof (GANIL)
- Louis-Alexandre Lalanne (IPHC)
- Vladimir Manea (IJCLab)
- Maud Versteegen (LP2iB)

GDR SCIPAC, axis "Heavy ions accelerators" coordinators:

- Enrique Minaya (IJCLab)
- Mickaël Dubois (GANIL)