

**Minutes of the SPIRAL2 meeting dedicated to Atomic Physics  
organized by J.Y. Chesnel, E. Lamour, M. Trassinelli and D. Vernhet  
in Paris on March 27-28, 2008 .**

All the talks are available on the present website.

**A. PRESENTATION OF THE SPIRAL 2 PROJECT AND ITS CONTEXT, GIVEN BY  
DOMINIQUE VERNHET (SEE THE FILE PRES\_ATPHYS\_SPIRAL2\_DV.PDF),**

During or following this presentation in 4 parts, several points have been raised and/or discussed:

1) On the choice of the ECR source for stable beams: Tests on the Phoenix-V2 and A-Phoenix with the transfer line (RFQ 88 MHz for  $A/q=3$ ) are in progress. The design for  $A/q=6$  is over. The question is still open for using  $A/q=3$  or  $A/q=6$ .

2) Recently the surface of IREA has been fixed to 84 m<sup>2</sup> after the move of S3 on the other side of the LINAC in order to be able to inject RIB produced by S3 in DESIR.

3) Budget: 80% are confirmed. So far, it is not sure that the budget will be enough for the 3 experimental areas. It will depend on the pressure of our community. In particular, the beam lines are not supported so far.

It was emphasised that a parallel discussion has to be done for the scientific prospective at the existing GANIL facility for the horizon 2015, since the future of the GANIL installation as well as the possible experiments foreseen are strongly connected to the SPIRAL2 project.

An important news is given during the meeting: Financial agreement between Germany and France has been signed regarding the FAIR and SPIRAL2 projects.

**B. PHYSICS CASES IN ATOMIC PHYSICS have been presented through 8 talks given by  
representatives of different research groups (see the book of abstract and the pdf  
presentations on the present website).**

Concluding remarks has been drawn by D. Vernhet (see the file CONCL\_ATPHYS\_SPIRAL2\_DV.PDF ), and discussed as follows:

The different proposals can be grouped together in 4 main topics:

- Collision dynamics with very low density targets namely, ions, biomolecules and mass selected clusters.
- Search for rare events (multi-electron capture and excitation processes)
- HCI cooling and mass measurements (more suitable with the low energy radioactive beams, i.e. DESIR)
- Hyperfine quenching for stable or radioactive ions making use of IREA or post accelerated rare isotope beams.

Motivation, techniques as well as beam quality requirements have been synthesized for each topic.

To complement the first topic dealing with low density targets, an additional case has been underlined by Thomas Stöhlker: a unique opportunity could be offered by the very high intensity stable beams of SPIRAL2 to perform crossed beam experiments using an electron beam as a target. Several participants declare to be very interested in this subject for investigation of mechanisms such as resonant transfer excitation etc.... The key point is that high intensity ion beams are required to perform crossed beam between ions and electrons.

Therefore, SPIRAL2 will be the most adequate facility (if not the unique facility) for such studies that cannot be done elsewhere.

Thomas Stöhlker and Theo Zouros will contact A Müller and Andreas Wolf (specialists in ion-electron collisions) to inform them that such a possibility could be offered by SPIRAL2. In addition, Denis Dauvergne declares his interest to be involved in this subject.

**Possible ECR source:** the  $A/q=6$  solution seems to be better suited for all the experiments that are very demanding in beam intensity, especially for heavy ions since the beam energy is still in the regime where the ion stopping power is maximum.

**Available beam time:** Jean Pierre Grandin informed us that 2 weeks per year could be dedicated to interdisciplinary research activities (looking at the possible scenarios under examination). This availability will be about the same than the present one at the existing GANIL facility for the high energy beam but significantly lower than that of the SME beam line.

### C. TWO DELICATE POINTS have been discussed

#### **The Time structure of the SPIRAL2 stable beam:**

For TOF measurements dealing with sputtering of surfaces, a time structure is clearly required: better than 1nsec (of burst width) every 100 nsec. Moreover, a suppressor should be added to perform measurements in the time scale of  $\mu\text{s}$  (or more). A time structure could be helpful as well for ion-ion collisions or other crossed beam experiments but it is not mandatory. Just before entering (or in) the experimental area, a (re)buncher seems to be required to correct for the time structure dispersion during the beam transport. With the existing GANIL beam lines, the time structure (of 1ns every 100 nsec) is kept almost constant along the transport while it does not seem to be foreseen for SPIRAL2. The reason does not seem very clear and should be asked to the project leader of SPIRAL2.

**The beam stripping:** An efficient stripping is needed for the program related to ion-ion collisions, for the hyperfine quenching measurements and for some of the studies presented on the search of rare events. It is mandatory to keep the gain in ion current compared to what can already be reached using CSS1 solo. Stripping studies need also to be performed for nuclear researches since after the thick target, strippers are needed to define the charge state of the exotic elements produced.

The Atomic Physics community is willing to take over this development. Actually, a post-doc position as well as funds for a prototype are already available through a FP7 contract in which the CIMAP is involved.

Amine Cassimi from the CIMAP laboratory in Caen (former CIRIL) accepts to be in charge for organising a working group on the stripping, including both experimental and simulation aspects. The group at the INSP (Paris) will contribute to the simulations adapting the ETACHA code they have developed to low density targets if necessary. The Atomic physics division at GSI is willing to participate in the experimental development, and will contact PSI and Argonne institutes. Several ideas have been raised as the use of fast rotating solid targets, liquid or gaseous targets as well as cluster targets.

Concluding remarks of this meeting and contributions of each representative will be used to settle basis of a first draft of the technical report which should include physics cases in some details since no LoI has never been submitted. The organizers of this meeting will take over this first draft.