Minutes of the Sixth Meeting of the Physics & Instrumentation Task of the EURISOL Design Study

CERN, 29th November 2006

T10-06,CERN,291106

Present: C. Angulo, E. Běták, M. Bruno, N. de Séréville, B. Fernandez Domingúez, S. Franchoo, P.T. Greenlees, J. Jastrzebski, N.A. Orr, R.D. Page, E. Pollacco, B. Roeder, P.M. Walker

1. **Minutes of previous meeting and matters arising:** It was agreed that the formats of the specimen experiments should be made consistent and the text styles coherent by the end of the year. The superallowed β decay proposals have been merged into a single specimen document, which is now on the EURISOL Task 10 web site (http://ns.ph.liv.ac.uk/eurisol), replacing the previous versions. It was suggested that the specimen experiments should be made more "glossy". [**Action: RDP to contact O. Lopez**]

It was noted that a fragment separator will be required for "knockout" and other in-beam spectroscopy type experiments – not just for secondary fragmentation to reach more exotic systems. A beam analysis device/spectrometer (such as the alpha-spectrometer at GANIL) will be needed to measure and define the beam energy for experiments using the high energy beams (up to 150 MeV/u). It was not yet clear whether this role could also be performed by the fragment separator or whether a separate device will be required. For experiments at low/barrier energies (~5 MeV/u) a simple double focusing dipole magnet with slits etc was expected to be sufficient. A cost estimate will be required for the fragment separator.

[**Action: B. Blank, N. Orr**]

It was pointed out that preliminary cost estimates for all apparatus will be required by June 2007, with revised (final) estimates by June 2008.

2. **Update on specimen experiments and instrumentation:**

a) **Neutron detection schemes for β-decay studies** N. Orr reviewed the work that was planned for this aspect of the Design Study. With current large element plastic scintillator based neutron detector arrays it is not possible to achieve the low-energy thresholds that are required, the energy resolution from time-of-flight is insufficient for studies of medium to heavy-mass nuclei having high level densities, the peak shapes are often poor and the absence of neutron/γ–ray discrimination leads to high backgrounds as well as precluding the possibility to detect multineutron events. The possibility of solving this last problem using pulse shape discrimination techniques will be explored. It was noted that the efforts of B. Roeder will focus on the detection of high energy neutrons (i.e., ~tens – 150 MeV). It was also noted that NEUTROMANIA is a short-term project (now entering the second year of its 2 year grant) searching for new organic solid scintillator materials and will most probably have a limited impact on this Design Study. A brief summary of the ideas for β decays and high energy neutron detection will be prepared for late January. [**Action: N. Orr**]

b) **Sweeper magnet, ancillary detectors and the Transfer Reaction Array** B. Fernandez Domingúez presented some preliminary ideas on these topics. E. Pollacco will provide information on the new magnet at GSI. It was clear that the sweeper magnet will have to have a large gap.

Simulations have commenced for transfer reactions using existing detector arrays as a starting point. It was intended that B. Roeder, B. Fernandez Domingúez and N. Orr will meet early in 2007 (possibly with M. Labiche and R. Lemmon) to organise a coherent strategy for the detailed simulations of the break-up reaction simulations with the Sweeper Magnet and neutron array etc.

c) **Integrated charged particle and γ–ray detector system** No presentation.

d) **Cryogenic and polarized targets** No presentation. It was noted that these might appear in with other specimen experiments.

e) **Recoil separator** P. Greenlees outlined the major problems posed by the intense beams of radioactive ions in terms of stopping and shielding the unreacted beam and the background arising from Rutherford scattering of the beam. N. Orr requested that a typical case should be chosen and the details of the beam requirements conveyed to him so that the requirements can be discussed by the Task 6 (Reaccelerator Group). [**Action: P. Greenlees**]
It was suggested that a spectrometer would be required for deep inelastic reactions. It was not clear whether this could be the same separator, or if another device would be required. Concern was expressed about the lack of funding for suitably skilled manpower for the recoil separator design, since those involved lacked this specialist expertise. It was estimated that around 18 months of effort would be required.

[**Action: RDP to pass on this request to the Management**]

f) **Any other proposals** None were proposed at this stage.

3. **Other news of progress from sub-tasks:** Only one item was raised.

f) **Astrophysics** C. Angulo reported that there would be a CARINA meeting near the end of January 2007. It was expected that around 3 specimen experiments would be proposed, including one which will be examined in greater detail. An outline for the astrophysics accelerator will also be prepared. The plan was to prepare drafts for mid-January for approval by CARINA.

4. **Reports on PDRA activities:** These had been covered under 2. a) and b), plus the talk by R. Lazauskas in the EURISOL Week meeting.

5. **EURISOL Parameter Database:** Strong views were aired during the discussion. The consensus was that Task 10 could be a user of a database, but it would be "totally inappropriate" to go beyond this. There were "no resources, no expertise and no wish to do this for Task 10". The tools proposed for the beta-beam task were not suitable for this work, where the simulations will be performed using GEANT4 to ensure compatibility with other major pan-European projects such as AGATA and those associated with FAIR.

6. **Issues for EURISOL DS Management:** N. Orr complained that funding under the equipment heading was lost and matching funding from the laboratories for equipment disappeared during the negotiation of the EURISOL DS Contract. Deep disquiet was also expressed about comments made during EURISOL Week about updating all of the physics case. RDP subsequently raised this issue at the Coordination Board meeting, where the Project Leader confirmed that the Task should concentrate on the design and costing of the apparatus and that updating the physics case was a wider issue that could fall into the remit of the ISOL users group. Concerns were also expressed about the milestone M3 relating to "in-beam tests to validate instrumentation schemes", which appeared during the contract negotiations. At the following CB meeting, it was agreed that this milestone should be interpreted as having a very limited scope, as fully covering all the schemes would be completely unrealistic. [**Action: RDP to feed this back to the Management**]

7. **Any Other Business:** S. Franchoo proposed an additional specimen experiment involving a laser ion source for hyperfine structure studies. This idea was warmly welcomed and applications for the preparation of isomeric beams, including some of interest for astrophysics such as ^{26m}Al, were immediately suggested. This will have implications for the Beam Preparation Task.
[**Action: S. Franchoo to send a brief outline to RDP, to be sent on to A. Jokinen**]
The possibility of holding another workshop near the end of the project was raised. This could be considered as part of the ISOL users group activity.

The time resolution required from the beam for certain experiments means that a rebuncher will be needed. It was felt that Task 10 lacked the necessary expertise to do this. The energy resolution of the beam that is required is still an issue for consideration, particularly for lower energy beams.

[**Action: N. Orr to feed this back to Task 6**]

8. **Date & venue of next meeting:** C. Angulo offered to host the next meeting in the Solvay Room, ULB, Brussels on 18th May 2007. This meeting will focus on the preparation of the preliminary design and costing report, due at the end of June 2007. Further details will follow in due course.