EPIC workshop Dec 2019

Strategy working groups: applications

The applications programme at ISOLDE has been running since the origins of ISOLDE and still constitutes about 15% of the annual beamtime. The range of beams available at ISOLDE offers many opportunities for studies in materials and biophysics. The sensitivity of nuclear probes to magnetic effects in materials and to local changes is an increasingly attractive option to probe and understand materials such as topological insulators and low dimensional materials. Similarly, the sensitivity of techniques such as beta-NMR compared to traditional NMR has immense potential in biophysics. The discussion on applications within EPIC produced the following recommendations:

- The isotopes typically utilized for application studies are typically not very exotic. The yields expected are usually >1e7 ions/s. However, the science that can be performed with such isotopes can be at the very forefront of materials physics, biophysics, medical applications etc. These factors should not be overlooked in the drive towards the production of exotic isotopes for nuclear physics. Rather, new future facilities should consider improvements for all users in the field of radioactive ion beams.
- The 2GeV upgrade – necessitating the upgrade of the ISOLDE beam-dumps – should be the trigger for increasing the capacity of the ISOLDE facility as a whole. Although the increase in yields which 2GeV will bring does not benefit this community as such, the upgrade offers an opportunity for such an increase either through the provision of twin front ends or new target stations.
- During 2018 parallel running was adopted for the majority of solid state runs at ISOLDE – taking 1-2 pulses of STAGISO protons while nuclear physics ran on the HRS. This allowed the facility to operate at a high capacity with up to 7 experiments running simultaneously. However it can only be implemented with careful choice of experiments on both GPS and HRS.
- Were such a parallel running be available on a more routine basis a more developed applications programme i.e in solid state physics, biophysics, biochemistry and medical physics would be possible. More systematic studies could be possible which would allow this field to become more visible and accessible to non-experts, and would allow for more high impact output addressing the fast moving time scales in e.g. materials science.
- Time is also a factor for medical physics. To exploit new innovative isotopes often requires trials involving animal studies. Increasing the capacity for such studies would allow ethics issues which are currently a factor to be overcome.
- Improvements in beam purity could also be a significant benefit to the community even at the cost of intensity. This would be especially the case for surface physics.
- Although not currently part of the EPIC scope, the current operation of ISOLDE by users is seen as a barrier to new users in fields who are more familiar with experiments at facilities such as synchrotrons and neutron facilities. More automation in the operation and provision of beams for applications would reduce this barrier. It would also trigger the current user community to improve automation of existing chambers and spectrometers allowing the focus to be on the science being studied and proposed. Custom beamlines for such experiments would also allow for safety issues to be more fully considered than is currently the case.

- The current user community would need to enlarge itself to fully profit from such an upgrade. Workshops and training events would be necessary to attract new users to the field to sustain the increased beam availability.
- An irradiation station would be of considerable interest to a wide community of scientists from geology to medical physics. This should be pursued as part of the upgrade of the ISOLDE beam dumps.