Director's Report

The Pelletron accelerator operation in this year had been smooth with very few problems. There were only two scheduled tank openings for maintenance of Pelletron. New stripper foils from Munich that have longer life were introduced at the terminal, which improved delivery of heavy ions, specially for materials science experiments. Accelerator Mass Spectrometry measurements with ^{26}Al is being developed and a chemistry laboratory is under preparation.

All the resonators in the first linac module were fitted with formed bellows this year and this eliminated the helium leaks and improved their performance on-line. The first linac module is now being used for nuclear physics experiments along with the superbuncher and rebuncher. Fabrication of resonators for the 2nd and 3rd modules is nearly complete and the two cryostats are in the process of assembly. The integration of these two modules is expected to be completed in the coming year. The cryogenic system was made more stable with uninterrupted power supply to the helium compressors. A new transfer line connecting the external storage vessels for liquid nitrogen was installed this year.

The Low Energy Ion Beam Facility has been providing a wide variety of highly charged ions for materials science and atomic physics. The entire beamline and high voltage deck for housing the LEIBF in the new building has been finalised and several of the components are installed in the new building. The process is expected to be completed in this year.

In the high current injector project, the layout and beam optics for the High Current Injector has been modified to fit in the existing space. The A/q ratio has been changed to six in order to reduce the length of RFQ and DTL sections. Good progress has been achieved with the fabrication of the model of first tank along with all the electrodes of drift tube linac and mapping of the field, which validated the design.

All the support laboratories, viz., target, beam transport, data support, vacuum, electronics continued to provided excellent support to the users and the utilities worked hard round the year helping the laboratory to maintain its record of high uptime.

The Indian National Gamma Array (INGA) was installed at the new beam hall of IUAC in early January, 2008 and regular user experiments started from Feb 28 with 18 clover detectors active. During the first Cycle of INGA operation (Feb 2008 – July 2008) fifteen user experiments were conducted. This was followed by three students' Ph.D. thesis experiments in Oct, 2008. Efforts are being made to augment the power of INGA array by adding a charged particle array and recoil distance set-up for measurement of lifetimes. An experiment to measure the Coulomb excitation cross sections for ^{58}Ni + ^{112,116}Sn was carried

out in collaboration with GSI group, which measured the B(E2) value for ^{112}Sn with much higher precision than hitherto available and thus verified the trend of larger experimental B(E2) ratios observed for ^{114}Sn and other lighter Sn isotopes compared to the theoretical prediction of a symmetric trend around N=66 mid-shell. The gas-filled phase of the Hybrid Recoil Separator has been commissioned and the first set of user experiments carried out. Evaporation cross-section measurements for the reaction ^{16}O + ^{194}Pt were carried out near barrier energies. The gas-filled separator with a large collection efficiency would facilitate measurement of reactions of low cross-sections.

There have been a large number of experiments in materials science with energetic ion beams on problems mainly related to electronic sputtering, ion beam mixing, nanostructuring of the materials, surface modifications, materials modifications, ion beam induced epitaxial crystallization etc. Empirical relations between heat of mixing and the electronic energy loss of the swift heavy ions in materials were observed in ion beam mixing studies.

The Automatic Sample Irradiation system for Radiation Biology Experiment, Aspire, has been installed and being used by the user community. This has resulted in the irradiation experiments being controlled remotely and led to considerable saving of beamtime.

The year was marked by the sanction of a major new high performance computing facility at the Centre. The facility will enable large scale simulations of ion-matter interactions to support the Centre's experimental program, and to provide a supercomputing facility accessible to all university research groups in the areas of materials science, nuclear physics, atomic and molecular physics, and radiation biology and physics.

During Sept 1 - Sept 20, 2008, we conducted the SERC School on Nuclear Physics at IUAC. The theme of the school was “Exploring symmetries in nuclei using the national accelerator facilities”. An Indo French conference on Nanostructuring by ion beams was organized, jointly by IUAC Delhi and CSNSM Orsay, fully financed by Indo French Centre for Promotion of Advanced Research. The Tesla Technology Collaboration held its meeting at IUAC last October and this provided an unique opportunity for the accelerator physicists and engineers in the country to interact with the experts in rf superconductivity worldwide. As in previous years, IUAC conducted several workshops and acquaintance programmes in different parts of the country to attract new users.

I expect the research and development work to grow further at the Centre with the generous support of UGC under the XI plan and invite the user community to come forward with innovative and challenging ideas.

Amit Roy

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