Director's Report

The Inter-University Accelerator Centre has completed 25 years of its existence. It is an occasion to reflect on the impact of the Centre specially in the context of its stated objectives, which is “To provide within the university system, world-class facilities for accelerator based research in some focussed areas". It is quite evident from the functioning of the Centre over this period, publications and the user base of the IUAC that this objective has been adequately fulfilled.

The operation of the Pelletron accelerator was quite satisfactory in this year with uptime of machine for this period being 99.2% and the beam utilization was 63.8%. The AMS facility for ^{10}Be and ^{26}Al measurements is now in operation and a new clean chemistry laboratory has been developed. The accelerator facility at the Centre was enhanced by the acquisition of a 1.7 MV tandem with facility for Rutherford Back scattering and Channeling studies.

In the past year the LINAC was operated continuously during April-May 2009 to conduct a number of scheduled experiments, in which, for the first time all the eight LINAC resonators were operational at an average field (Ea) of ~ 4 MV/m. The 2nd and 3rd cryostats were completed and installed in the beam line. We plan to mount the sixteen resonators in linac cryostats 2 and 3 this year. Two single cell 1.3 GHz TESLA type Nb cavities were successfully welded under the collaboration project with RRCAT.

The detailed beam optics for HCI has been simulated for various options. The RFQ prototype has been tested upto 10 kW power for checking the cooling efficiency. First tank of Drift Tube Linac has been designed and order has been placed for its fabrication.

The support laboratories and the utilities all worked in their usual quiet and efficient manner.

We have now completed two years of operation of Indian National Gamma Array (INGA) at IUAC. During this period, more than thirty user experiments were conducted. With INGA now shifting to TIFR, focus of nuclear physics experiments at IUAC will be on nuclear reaction studies. The Charged Particle Array in GDA has been used for studying spin distribution in incomplete fusion reactions. The role of shell closure on transfer probability was studied for reactions ^{16}O + ^{90,94}Zr at near barrier energies using recoil separator HIRA. The dynamics of fission for nuclei with moderate fissility has been studied through pre-scission neutron multiplicity as well as the mass distribution of fission fragments. The role of quasi-fission for heavier projectiles is clearly indicated by the above measurements.

A total of nearly 90 user experiments were performed in materials science this year, without any beam time loss due to major facility break down. The study on evolved gases monitored by online QMA gave an insight to the possible reactions within the ion track

core, occurring in the ion irradiation of Ni film deposited on PTFE system. Surface plasmon tuning of the Ag-C_{60} nanocomposite thin films was demonstrated by ion irradiation. SHI induced modification studies were performed on different nanocomposite systems such as Ni-Alumina, ZnO-PMMA, SnO_2-PPY, Fe_2O_3-polymer etc. Low energy ions from LEIBF were used to create the nanostructures at the surface of CdS thin film. Several experiments were performed on different possible materials for Thermoluminescence dosimeter applications.

In Radiation Biology, a project is focusing on the high LET radiation induced gene expression studies. It measured several apoptotic parameters and monitor the expression of few genes in human cervical epithelial carcinoma (HeLa) cells irradiated with carbon beam in presence and in absence of PARP inhibitor in HeLa cells. Another project studied high LET radiation action on breast cancer cells CHAGO.

A dedicated beam line in beam hall II has been commissioned to study the effect of hyperfine structure on inner shell ionization. Position sensitive multi-hit time-of-flight measurement system has been used to study the fragmentation dynamics of complete and incomplete fragmentation process at high velocities.

The computing power available at the Centre got a big boost with commissioning of the high performance computing centre this year. Preliminary tests of the first phase showed that the system is capable of operating at 6.5 terraflops. It is now open to users.

Apart from the usual programmes for Ph D. and M.Sc. students, a new programme for undergraduate students in summer was started from this year.

All these activities would not have been possible without the generous support of the University Grants Commission and we look forward to greater progress in the forthcoming years.

Amit Roy

May 2010