

Director's Report

The year 2002-03 was quite eventful for the Nuclear Science Centre in terms of both research carried out and development of facilities. The timely support of the University Grants Commission with reasonable funds has allowed the activities to grow. The central facility, Pelletron accelerator ran quite smoothly and maintained a high uptime of 96%. The installation of the multi cathode SNICS source improved the beam transmission through the machine and also resulted in better utilisation of machine time. A total of 78 experiments were conducted in the fields of Nuclear Physics, Materials Science, Radiation Biology and Atomic Physics. The user base has extended further this year and now comprises of 67 Universities, 41 Colleges and 39 National Institutions.

The accelerator augmentation programme got a boost with all the components of the indigenous resonator fabrication facility fully functional and completion of welding of the Niobium parts of the first cavity. The first linac module and the beam line components upto the switching magnet have been aligned and are being readied for the first beam test. Computerisation of the cryogenic system has considerably eased the operation of the facility. A new generation ECR source with HTSC coils has been designed in collaboration with M/s Pantechnik and ISN, Grenoble and fabrication has began.

New detector set-ups for RIB experiments, light particle detection and time-of-flight were developed. Metallic Gd targets were successfully prepared by the use of reduction of oxides. New stripper foils are being developed incorporating a layer of C₆₀ sandwiched between carbon layers. FPGA based CAMAC modules were developed and a clover electronics module developed in-house was successfully used during the INGA runs. Computer and communications systems were upgraded resulting in greater application speeds for the user. Emphasis was given on energy saving in running the power and AC systems.

A major event for Nuclear Physics research has been the setting up of the 8 clover array of Indian National Gamma Array (INGA) at the target position of the spectrometer HIRA. This national activity generated a lot of enthusiasm among the Nuclear Physics community in India. The system operated for about 6 months at a stretch with pooled resources from all the participating institutions in INGA. It provided a testing ground and also validated the multi-crate data acquisition system CANDLE and the electronics modules built in-house. The combined detector system allowed the study of high spin spectroscopy of weakly populated nuclei which were hitherto not possible in the country. Two experiments using the RIB ⁷Be were conducted, one being the experiment to determine the astrophysical S₁₇ factor was repeated for consistency and completed and the other was scattering of mirror nuclei. The neutron detector array and pulse shape detection module were operational and used in several experiments.

Experiments on the effect of Swift Heavy Ions (SHI) in materials continue to attract large number of users. Several experiments were conducted to study the influence of SHI at the surface and interface of different materials, which were greatly facilitated by the use of the large area position detector developed in-house. Synthesis of nanomaterials, SHI effects on dielectrics, magnetic properties and hardness were investigated in ferrites, HTSC, LCMO and PZT thin films. Latent tracks were observed through TEM in fused silica as a result of Ag ion bombardment. Field emission characteristics of CVD diamond films improved as a result of Ag ion irradiation.

Experiments in Radiation Biology continued to study the chromosome aberration and activation of signalling molecules due to ion interaction with mammalian cells. The two-foil method of measuring lifetimes were continued and used for determining the lifetimes of metastable He- and Li-like Ti atoms.

We hope to maintain the momentum of activities in the coming year and possibly accelerate it further with the addition of new manpower to be released under the Xth Plan.

April 2003

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