From the Director's Desk...

It is a pleasure to see the second issue of RRCAT Newsletter for 2011 ready to go to press. The issue gives an account of several recent activities and achievements of the Centre.

Both the Synchrotron Radiation Sources, Indus-1 and Indus-2, have been operating in the round-the-clock mode: Indus-1 at 450 MeV energy, 100 mA current, and Indus-2 at 2.0 GeV energy, 100 mA current. With closed orbit correction and round the clock operation, the beam life time in Indus-2 has reached 22 hours at 2.0 GeV, 100 mA. The period of continuous operation in one filling has also increased to a maximum of ~ 40 hours and the accumulated current at the injection energy increased to 200 mA.

The Centre has made an outstanding achievement in developing new technology of solid state RF amplifiers to replace high power klystrons for which difficulties were faced in the procurement. Starting with necessary transistors and other components, two units of solid state amplifiers of 15 kW RF power, each operating at 505.8 MHz, have been developed. These have been coupled to two RF cavities in Indus-2 and successfully operated in round the clock mode. This has facilitated the enhancing of Indus-2 operation to 2.3 GeV, 108 mA. With the construction of more number of such solid state RF amplifiers, Indus-2 operation at 2.5 GeV, 100 mA is targeted in the year 2011-12. It may be mentioned here that the successful development of high power solid state RF technology is an important step towards achieving self-reliance in this strategic area which will also be useful for building high energy proton accelerators for SNS/ADS programmes in future.

Three beamlines viz EXAFS, EDXRD and ADXRD have been operational and have been used by many researchers for studies on samples with large magneto-resistance, Pb-free ferroelectric and piezoelectric samples, cobalt oxide nanoparticles, soft magnetic glassy alloys, bi-nuclear copper complexes, materials for solid oxide fuel cells etc. Two more beamlines viz. X-ray fluorescence (XRF) microprobe and soft and hard X-ray lithography have been recently commissioned. These have also been used for many studies, e.g. for analysis of uranium-thorium samples for trace impurities, elemental composition of archaeological samples, lunar stimulant samples for Chandrayan project etc.(XRF beamline), and for fabrication of compound refractive lens, microfluidic devices, photonic band gap materials and high aspect ratio 3D-MEMS structures (lithography beamline). Several results have already appeared in international journals.

In the laser related activities, a number of noteworthy advancements have been made showing the high quality of research, development and applications. Some examples are development of tools and technology for cutting and welding operations for leak repair in the secondary shutdown system in standpipe bellow in PHWR at Kaiga Atomic Power Station 3&4 by employing the fibre-coupled remotely controlled Nd:YAG laser, ultrafast X-ray diffraction using monochromatic X-rays in ultra-intense laser plasma interaction to study response of materials on propagation of intense laser driven shocks, polarization sensitive optical coherence tomography for near real time imaging of tissue birefringence, generation of femtosecond laser pulses from mode-locked Yb-doped fibre laser, use of diode-pumped Nd: YAG laser for selective laser melting, role of high order optical non-linearities on transient absorption in nano-platelet colloids etc.

Some of the above advancements and other recent activities are reflected in this issue of Newsletter. For more details the concerned scientists and engineers may be contacted. In the end I wish to compliment the members of the Editorial Board for their laudable efforts in bringing out this issue.

With best wishes
Nov 26, 2011

P. D. Gupta
Director