



From the Director's Desk....

It is heartening to see the second issue of RRCAT Newsletter for 2012 ready for publication. The issue gives account of several recent activities and major achievements of the Centre since the beginning of this year.

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 2.5 GeV energy, 100 mA current. Indus-2 is now being operated with the help of high power solid state RF amplifiers which have been developed for the first time to operate at high frequency of 505.8 MHz. These amplifiers have replaced the two failed klystrons for which difficulties were faced in the procurement. The output power of the solid state RF amplifier system has been further enhanced to 125 kW. Next, the commissioning of the low emittance electron beam optics in Indus-2 ring, the upgradation of the control software and the development of the longitudinally coupled bunch mode measurement system have further improved the performance of Indus-2.

Currently five beamlines are operational on Indus-1. With the addition of the Protein Crystallography beamline, the number of operational beamlines on Indus-2 has now increased to seven. Seven more beamlines for Indus-2 are in advanced stages of development. The Angle Dispersive X-ray Diffraction beamline (ADXRD) has been augmented with a high pressure XRD setup. Further, a number of focused interaction meetings with prospective synchrotron radiation users have been organized on different topics. It is a pleasure to note that these have resulted in significantly enhanced utilization of the Indus-1 and Indus-2 beamlines and several papers have already been published in international journals.

The Centre has made notable progress in the programme on the development of superconducting radio-frequency cavities and cryomodules, related test facilities and technical infrastructure including cryogenics systems. This is required for the Department's long term programme on setting up of high energy, high current superconducting proton linacs for spallation neutron source / accelerator driven sub-critical system. Subsequent to the successful development of two single-cell 1.3 MHz superconducting RF cavities, a 1.3 GHz 5-cell niobium cavity has been fabricated. A new technique of laser welding has been applied for the first time to fabricate a single-cell niobium cavity. The performance of both these cavities will be tested soon. A 9-cell copper cavity has also been fabricated using laser welding to facilitate development of tuner mechanisms for SCRF cavities. Further, a 2K cryostat has been fabricated to set up a vertical test stand for characterization of the superconducting RF cavities. In the field of cryogenics development, the liquefaction rate of the first indigenously developed helium liquefier has been enhanced to 20 litres/hour.

Under the laser programme, a number of important advancements have been made reflecting the high quality of R&D work and applications. Bose-Einstein condensation of the Rubidium atoms has been accomplished through laser cooling along with RF evaporative cooling in a double magneto-optical trap. The other notable achievements include : the development of a compact LED-based combined fluorescence and Raman spectroscopy system for diagnosis of oral cancer, development of Er:Yb co-doped fiber laser providing 1.55 micron light in eye-safe region, a laser micro-machining set-up, laser shock peening for life extension of fatigued mechanical components such as spring steel specimens, isotopically selective optogalvanic spectroscopy of Europium using CW ring dye laser etc.

Some of the above advancements and other recent activities are discussed in this issue of the Newsletter. It also carries three theme articles which address (i) microfabrication using X-ray lithography beamline on Indus-2, (ii) techniques to grow lithium niobate and lithium borate single crystals, and (iii) the R&D work on optical tweezers and their use for manipulation of microscopic objects. These present a comprehensive description of the scientific activities with significant R&D accomplishment and resultant applications.

In the end, I wish to compliment all the members of the Editorial Board for their dedicated efforts in bringing out the newsletter in time.

With best wishes

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(P D Gupta)
Director