



From the Director's Desk...

It is a pleasure to note that the second issue of this year's RRCAT Newsletter is ready for publication. As always, it gives an account of the various research and developmental activities that have taken place in the Centre during the first part of the current year.

Our whole-hearted efforts have helped us in not only sustaining the operation of both Indus-1 and Indus-2 synchrotron radiation sources in round-the-clock mode, but the stored beam current of Indus-2 has also been enhanced to more than 150 mA at the full energy of 2.5 GeV. This has been made possible following the replacement of failed klystrons with the in-house developed solid-state RF amplifiers and by increasing their output power to 200 kW at 505.8 MHz, the operating frequency of Indus-2. Four more beamlines have been installed and commissioned in Indus-2 and with this a total of twelve beamlines are now operational and available to researchers from various universities, research institutes and national laboratories. Indus-1 is also operating consistently with its all five beamlines producing excellent research output.

Keeping in mind the importance of superconducting radio-frequency (SCRF) cavities for development of high energy proton linac for the long term programme on an Indian Spallation Neutron Source, necessary infrastructure for their fabrication and testing has been set up. A 5-cell 1.3 GHz niobium cavity has been fabricated and sent to Fermilab for processing and testing its performance. Also, a single-cell 1.3 GHz niobium cavity has been fabricated by laser welding using a fiber-coupled Nd:YAG laser. This is the first laser-welded superconducting RF cavity developed in the world. Next, a significant important development has been made in the area of cryogenics where an aluminium plate - fin heat exchanger of 64 kW rating has been indigenously developed for the first time in the country. This will be used in enhancing the capacity of the in-house built helium liquefier to 50 l/hr.

In the area of lasers too, a number of frontline advancements have been made. Demonstration of laser wake-field acceleration of electrons in plasma plumes produced by high intensity laser, development of a chirped pulse amplification based 40 TW Nd:glass laser system, laser cooling and trapping of noble gas krypton atoms, development of diode-end-pumped Nd:YVO laser and specialised optical coatings, and investigation on anatomical variability of in vivo Raman spectra for oral tissue classification are few examples that are reported in this issue.

The theme articles indeed give the Newsletter a scholastic flavour. The article on the Indus-2 control system and its evolution over the years to cater to the necessary requirements for enhancing the performance of Indus-2 highlights the capabilities being created in this area. The content of this article, I am sure, would be a valuable reference material for future. Next, laser driven electron acceleration method can provide very high accelerating fields in a compact setup, which makes this area of great R&D interest. A theme article on laser wake-field acceleration (LWFA) in this issue nicely outlines the various theoretical and technical details of LWFA schemes. The issue also features an article on a promising area of research on ultrathin quantum wells being pursued in the Centre.

It is always exciting to present the activities and interests of the colleagues at our Centre and each issue of the Newsletter brings these to the fore. I wish to congratulate the Editorial Board for their sustained efforts in accomplishing this important task.

With best wishes

October 15, 2013

P. D. Gupta
(P D Gupta)
Director