From the Director's Desk....

It is a pleasure to see the first issue of this year's RRCAT newsletter ready for publication. This issue includes various news items describing the research and developmental activities of the Centre during the second half of 2014.

The synchrotron radiation facility has been working round-the-clock with Indus-2 operating up to 200 mA current at 2.5 GeV energy and Indus-1 at 100 mA current and 450 MeV energy. A landmark development was the installation and commissioning of two indigenously designed insertion devices (planar undulators) in the Indus-2 storage ring. The front-ends and beamlines for the two undulators are under development. These will pave the way to our entry into the regime of 3rd generation sources.

It is heartening to note that the Indus beamlines (twelve on Indus-2 and six on Indus-1) have users coming from all over the country. The beamlines have been used for a variety of R&D studies, including the development of compound refractive x-ray lenses using x-ray lithography to focus hard x-rays in the 8-18 keV energy range. The high intensity synchrotron radiation allowed probing of buried interfaces with atomic resolution, study of structures of proteins, high definition imaging of bone osteoporosis, development of an electrostatic comb drive for micro-sensing and micro-activation etc. There is a continuous effort to upgrade the facilities in different beamlines.

The Centre is pursuing a comprehensive science and technology program for design, development and testing of superconducting radio-frequency (SCRF) cavities and cryomodules which have a key role in the Department's long-term programme on spallation neutron source and accelerator driven systems. The first 1.3 GHz five-cell SCRF cavity fabricated at the Centre has shown a high accelerating gradient and excellent quality factor. A blade tuner as well as a new tuner mechanism (X-link) have also been developed for 1.3 GHz cavities. A Japanese patent has been granted for the novel technique of laser welding of SCRF cavities.

The accomplishments in laser R&D have been equally noteworthy. An important achievement was the development of water-jet assisted underwater laser cutting. This technique was successfully deployed at the Dhruva reactor at BARC for in-situ cutting of spent fuel aluminium tubes stored in a 5 m deep water pool. Laser rapid manufacturing was used to fabricate specialized components of nuclear reactors and clad surfaces for high temperature applications. Several lasers have been developed for various applications. Basic research using lasers is also a key activity of the Centre. Protons have been accelerated to several MeV energy by irradiating thin foils with ultra-intense laser pulses. A laser micro-manipulation set-up was developed to observe and study functional aspects of intercellular connections (tunnelling nanotubes) in the cells of a tumour spheroid.

The Centre has future plans of taking up mega projects like the Indian Spallation Neutron Source and a high brightness synchrotron source which will be situated in the northern side of the campus. In view of the expanding activities, a new gate, named the North Gate, has been built to provide access to the campus from national highway NH59 (Dhar Road). This gate was inaugurated by Dr. R.K. Sinha, Chairman, AEC & Secretary, DAE during his visit to the Centre on July 26, 2014.

This year the Department is celebrating its Diamond Jubilee Year. A number of activities are planned by RRCAT to enhance awareness among common man about the programmes of the Centre and the Department. More than 2000 students, teachers and members of public visited RRCAT during the Science Day celebrations. Every year the Centre offers project opportunities to about 130 M. Tech. students from all over the country. This year, in addition, a two-month advanced orientation summer course on accelerators, lasers and their applications is being started for M.Sc. and M.Tech. students.

I would like to end by expressing my appreciation of the efforts made by the Editorial Board to bring out the newsletter regularly to highlight the R&D activities of our Centre.

With best wishes,

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P. D Gupta

(P D Gupta)
Director