From the Director's Desk....

I am quite happy to see that the first issue of RRCAT Newsletter for 2013 is ready to be launched shortly. This issue gives an account of the recent R&D activities and major accomplishments of the Centre during the second half of the year 2012.

Indus-2 has been operating at a beam energy of 2.5 GeV and a stored beam current of 100 mA since the month of May 2012. Radiofrequency (RF) cavities of Indus-2 are now being energised by the in-house developed high power solid state RF amplifiers with a total RF power of 175 kW at 505.8 MHz, thereby eliminating the dependence of Indus-2 on imported klystrons. Consistent performance of various sub-systems including un-interrupted ultrahigh vacuum for past three years and optimization of RF voltage and phase on the accelerating cavities have led to improvement in beam lifetime to 16 hours at 2.5 GeV, 100 mA operation. Further, to enable the measurement of various electron beam parameters like bunch length, bunch separation, bunch filling pattern etc., a diagnostics beam line in the visible region has been installed at Indus-2. The number of operational beamlines on Indus-2 has thus increased to eight. All these beamlines along with five beamlines on Indus-1 are made available to users from all over the country. A total of 6 interaction meetings were organized during the year 2012 to make researchers aware of this national facility. A large number of papers based on research carried out using Indus synchrotrons beamlines have been published in international journals.

The Centre had earlier developed two 1.3 GHz single-cell SCRF cavities which were successfully tested at 1.8 K to achieve accelerating gradient up to 40 MV/m at $Q > 1.0 \times 10^{10}$. Building on this expertise, a 1.3 GHz five-cell SCRF cavity has now been developed at RRCAT under Indian Institutions - Femilab Collaboration. This cavity is being sent to Fermilab for testing of its performance. The other significant achievements in the accelerator program, reported in this issue, include development of compact 476 MHz, 1 kW solid state pulsed power amplifiers, development of a prototype dipole magnet for the 700 MeV booster synchrotron, observation of the first signature of coherent terahertz radiation from the compact ultrafast terahertz free electron laser (CUTE-FEL) developed at RRCAT, among others.

In the area of lasers, the various reports depicting the latest results illustrate the high quality of research and development that is being pursued at the Centre. Development of a number of laser systems such as a 150 W high brightness solid state green laser for defence application, a krypton chloride excimer laser ($\lambda = 222$ nm) and a high power (160 W) single transverse mode Yb-doped CW fibre laser are reported in this issue. A combined depth-sensitive Raman and optical coherence spectroscopy based setup has been developed for layered tissue analysis. Large size Nd doped laser glass rods have been indigenously developed under a collaborative project with Central Glass & Ceramic Research Institute, Kolkata. These developments are also included in the present issue of the Newsletter.

Every issue of the Newsletter carries theme articles which cover areas where the Centre has made significant contributions. The three theme articles in this issue are on the design and development of the new technology of high power solid state RF amplifiers which have replaced the failed klystrons in the RF power system of Indus-2, ultra-fast spectroscopy of various nanostructures, and on correlation between microstructure-texture and magnetization in ferrite thin films.

I am sure this issue will give the readers a flavour of some of our recent activities. 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 sustained efforts in bringing out the Newsletter issue in time.

With best wishes

March 30, 2013

P. D Gupta

(P D Gupta)
Director