



From the Director's Desk...

It is a pleasure to note that the first issue of 2010 RRCAT Newsletter is ready for printing. The issue gives an update on a number of significant advances made in the Centre over the past few months. These include operation of Indus-2 at 100 mA beam current and starting of three shift operation of the Indus accelerators. Simultaneously, building of various facilities required for full exploitation of the two machines has also progressed considerably. The other significant developments reported in the issue, concern the Indus-1 magnet power supply cycling, development of magnet power supplies for compact ultrafast terahertz free-electron laser (CUTE-FEL) beamline and photocathode gun based Linac, and development of 110kV, 24 A, solid state bouncer modulator for CERN 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. The development of forward Raman scattering techniques for studying self-modulation of ultra-short intense laser pulses required for laser wakefield electron acceleration as well as the use of coherence gating method for measurement of nanometer scale optical path length variations in biological specimens are few of the examples that are included in this issue of the Newsletter. The three theme articles cover areas where the Centre has made significant contributions. The first one describes various cryocoolers that have been developed in the Centre and also their role in various scientific and technological applications of low-temperature physics. The article on generation of ultrashort laser pulses outlines various theoretical and technical aspects of this important field of research. The Young Scientist Forum focuses on a promising area of research on metal nanoparticles, which have myriads of potential applications in science and technology. In addition, the issue carries reports on several events, notable achievements and details of publications of the staff members.

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 dedicated efforts.

With best wishes

P. D. Gupta
Director

From the Editor's Desk....

A warm welcome to the first issue of the Newsletter of 2010! The editorial board is happy to bring out this issue, which covers scores of activities the Centre has witnessed over the later half of the past year.

The Newsletter begins with reports spanning the different aspects of research and developments in the area of accelerators from development of magnet power supplies for CUTE-FEL beam line and photocathode gun based Linac to the development of 110kV, 24A, solid state bouncer modulator for CERN. The different facilities created towards improved operation of Indus-2 including control and integration of Indus-2 pneumatic gate valves, extension of Indus-2 machine safety interlock system (MSIS) and Indus-2 control system software enhancements are also reported. Following these is an account of various accomplishments in the field of lasers and its applications ranging from development of techniques for studying self-modulation of ultra-short intense laser pulses to the use of phase sensitive spectral-domain optical coherence tomography method for measurement of nanometer scale-optical path length variations in biological specimens. The Infrastructure section of the issue depicts various important developments including commissioning of Teraflop HPC cluster Kshitij-1 for scientific computing applications and commissioning of network access control system for enhancing RRCATNet security. This is followed by the three theme articles, which focus on three important areas of research activities. The first one describes development of cryocoolers for various scientific and technological applications requiring low temperatures in the range of 10 K - 70 K, the second one details design and development of a terawatt class Ti:sapphire laser system and use of the energetic laser pulses for nonlinear optical experiments, and the third article in the Young Scientists Forum provides a vivid presentation on the effects of shape of metal nanoparticles on their optical properties.

It is our privilege to put together all these contributions. The editorial board is happy to acknowledge the time and effort that have been devoted by the different contributors and would like to sincerely thank them all. Our special thanks are also due to Dr. P. D. Gupta, Director, RRCAT for his continuous support and encouragement. As always, we welcome suggestions and criticisms to improve the quality and usefulness of our endeavours.

Chief Editor
RRCAT Newsletter