



From the Director's Desk...

It is heartening to see the second issue of the RRCAT Newsletter for 2018, which brings out a wide spectrum of activities of our Centre.

The Indus-1 and Indus-2 accelerators continue to provide synchrotron radiation to users, on the round-the-clock basis. At the same time, their capabilities are also being augmented. To provide higher RF power for operation with insertion devices, sixth and last RF cavity has been installed in Indus-2 during two weeks' shutdown in April 2018. It is working quite satisfactorily in round-the-clock mode operation. A disaster recovery setup for Layer-1 of Indus control system has been established to ensure the availability of control system for operation, control, monitoring and data logging of the facility from an alternative location in case of any eventuality. A CPU board based on open source hardware and software has been developed with an aim to replace the old VME CPU boards in Indus-1 and Indus-2 control system hardware and to cater to new requirements. The Newsletter also covers soft x-ray reflectivity measurements to estimate the composition of boron carbide thin films, study on the structural, spectroscopic and dielectric properties of BaTiO₃ samples, and evaluation of soft x-ray optical performance of multilayer mirrors using BL-03 beamline of Indus-2.

As a part of the R&D activity to get experience on the sub-systems required for the future Spallation Neutron Source, the first high beta five-cell 650 MHz SCRF cavity, which was fabricated last year, has been successfully processed and tested at 2K using the in-house developed infrastructure facilities. This is also a deliverable to Fermilab under the Indian Institution - Fermilab Collaboration. The beam transportation and characterization studies have been carried out by coupling a filament based multi-cusp arc discharge type H⁺ ion source with low-energy beam transport line. A European patent has been awarded to the SCRF cavity tuner.

The first electron linac (Linac-B1) has been commissioned and tested for 9 MeV, 5 kW operation at Agricultural Radiation Processing Facility (ARPF) at Indore. The second one (Linac-B2) has also been shifted to ARPF site and its system integration activities are in progress.

Several noteworthy accomplishments have been made in the areas of lasers also. A system for laser additive manufacturing using powder bed fusion has been developed, in addition to the existing system based on direct energy deposition. A 7 J, 10 ns Nd:YAG laser oscillator-amplifier system has been developed to augment laser shock peening activities, besides being useful in numerous research and industrial applications. Our Centre has been contributing significantly by developing lasers and procedures for their use in nuclear reactor related applications. An inspection system for the evaluation of x-ray gamma auto-radiograph of fast breeder test reactor fuel pins has been developed in our Centre and commissioned at BARC. The cutting of stuck north end of S-7 coolant channel of KAPS-2 reactor has been accomplished using a system based on in-house developed fiber coupled pulsed Nd:YAG laser. This was for the first time that remote laser cutting operation was successfully carried out inside the core of a reactor. The Newsletter also covers development of a cost effective maskless photolithography system for modern semiconductor devices; the results of a study for generation of antibacterial surfaces on type 304L stainless steel through laser surface texturing; synthesis of Au-ZnO nanocomposite and their characterization for photo-catalytic degradation of dye solutions, among others.

Theme Articles in the Newsletter provide a comprehensive overview of photonic nano-jets, recent developments in the technology for ultra-high vacuum at our Centre, and theoretical considerations in the design of a solid-state RF amplifier module.

This summer, RRCAT campus experienced added enthusiasm and energy as 40 students participated in the 4th orientation course OCAL-2018. Eleven YSRP-2018 students and four IASc-INSA-NASI Summer Research Fellows worked on projects in various advanced topics in science and engineering. Earlier this year, the new Convention Centre was inaugurated by Dr. R. Chidambaram and since then it has hosted a large number of events including InPAC-2018 and NSRP-21. DAE has appreciated Centre's initiatives during 'Swachhta Pakhwada' and awarded a *Certificate of Excellence*, with first rank among all DAE units.

I compliment the Editorial Board members for their commendable efforts in bringing out the Newsletter.

With best wishes,

September 04, 2018

(P. A. Naik)
Director