



From the Director's Desk...

It gives me pleasure to announce the publication of the second issue of RRCAT Newsletter for the year 2022 covering various R&D and infrastructural accomplishments of the Centre from January - June 2022.

I am delighted to point out that the operational performance of the Indus synchrotrons facility at RRCAT is restored to the pre-COVID-19 level in this period. The synchrotron sources Indus-1 and Indus-2, were operated for 171 days, and a total of 474 user experiments were carried out using the beamlines during this period. The Indus synchrotron radiation facility is taken up under the qualification incentive scheme of the department.

The electron beam radiation processing facility (EBPF) has reached to a matured level of operation to provide e-beam irradiation service to regulated medical devices and other industrial products on professional basis. Further, to facilitate the precise time-synchronized operation of Linacs for EBPF, a 16-channel programmable trigger generator (PTG) module has been developed. Progressing on the front of electron Linac development, endurance testing of food irradiation Linac-3 having a maximum electron energy limiting system to less than 10 MeV to meet the regulatory requirements for food irradiation was done. Another developmental work accomplished during this period is related to the design, fabrication, and testing of a 2 kW DC strip type electron gun system, which will be used to test the photon absorbers in laboratory.

Towards development and setting-up of infrastructure facilities for fabrication, processing and testing of Super Conducting RF (SCRF) cavities, a horizontal test stand (HTS) facility has been commissioned at RRCAT for high power testing of “dressed” SCRF cavities at 2 K and a five-cell 650 MHz dressed SCRF cavity with high power coupler was successfully tested. A new VME32 controller board has been developed for use in the present and future accelerator control systems. Besides various accelerator related accomplishments, non-destructive depth profiling of energetic Au ions inside p-type Si substrate and the identification of superstructure in the Heusler alloy $\text{Co}_{1+x}\text{MnSb}$ and its effect on the structural and magnetic properties was also done.

RRCAT has some important achievements in the area of laser technology and laser materials. Development of Nd:YAG laser with average output power of 1.5 kW has been completed. This laser system has long pulse operation capability and so it will find applications in cutting and welding of metals and alloys in nuclear power programme, which could not be done earlier. Growth of good quality large-size KDP crystals (160 mm × 155 mm × 120 mm) for the fabrication of Q-switching elements for high energy Nd:Glass lasers and Cr:Nd:GdVO₄ laser crystals is carried out. Development of an in-house MOVPE-grown GaAs-based detector for measuring X-ray absorption edges of transition metals and their alloys is completed. A super-capacitor module of 4.5 kJ capacity got fabricated from industry under guidance of RRCAT utilizing the Nitrogen-doped carbon aerogel synthesized at RRCAT.

The invited *Theme Articles*, of the RRCAT Newsletter, provide an opportunity for the authors to present an overview of the work carried out in their respective laboratories. This edition has three invited *Theme Articles*. The first *Theme Article* reviews the design and development of active shunts for beam-based alignment of beam positioning monitors in Indus-2, which has resulted in an enhanced performance of the Indus-2. The design and development of machine vision based inspection systems in the automation and quality assurance of the nuclear fuel fabrication process has been described in the second *Theme Article*. The third *Theme Article* is based on research work carried out as a part of Ph. D. thesis. It presents the experimental studies carried out to investigate the effect of various process parameters on laser-directed energy deposition based additive manufacturing of Hastelloy-X thin walls and bulk structures.

On the occasion of RRCAT Foundation Day, three different technologies, namely, Raman Probe, OncoVision, and TuBerculoScope were transferred to the Indian industries. Besides transfer and incubation of technologies, the Incubation Centre-RRCAT has also started offering the services of EBPF for the sterilization of medical devices to the industries under “Azadi Ka Amrit Mahotsav”.

The National Science Day-2022 was celebrated in online mode on 28th February 2022. Students and teachers of several schools and colleges from Indore and nearby cities joined the online program. Centre continued a sustained effort towards a clean and green campus at RRCAT. I take this opportunity to congratulate all the scholars, who have been awarded Ph. D. degrees by HBNI and all the staff members who have won accolades for their respective contributions in R&D work.

I express my appreciation for the effort put in by the Editorial Board to bring out this issue of the Newsletter, presenting a broad spectrum of activities pursued at the Centre.

With best wishes,

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Director, RRCAT