



From the Director's Desk...

I am glad to see that the first issue of this year's RRCAT Newsletter is all set for publication. This issue showcases the Centre's R&D and infrastructural accomplishments from July - December 2021.

The two synchrotron radiation sources Indus-1 and Indus-2 were operated smoothly as a national facility, following the prescribed safety procedures during the second half of 2021 (July-December) after these were restarted post second lockdown in June, 2021. Indus-1 and Indus-2 were operated in round-the-clock mode during these six months and synchrotron radiation beam was provided to the users. The maximum beam lifetime in Indus-2 at 100 mA @ 2.5 GeV has been increased to 116 hrs. A major upgradation work involving the successful installation and commissioning of indigenously developed horizontal and vertical pinger magnet system in Indus-2 for carrying out advanced beam dynamics studies was completed during this period. In view of its importance, a *Theme Article* giving overview of pinger magnet system installed in Indus-2 is included in this edition of the RRCAT Newsletter. Another up-gradation accomplished during this period is related to the commissioning of a three mirror-based higher-order suppressor system in the soft x-ray reflectivity beamline BL-03 of Indus-2 to improve the spectral purity of the beam. In spite of the ongoing pandemic, the number of users of the synchrotron beam lines increased steadily in this period. The total number of user experiments carried out in this period at the beamlines is 365. Few users from the industry utilized the beamlines for x-ray diffraction measurements. In this period 118 research papers were published in peer-reviewed international journals based on the work carried out on the beamlines. Another important task of the development of new hardware and software modules to remotely control the power supplies energizing orbit correction coils in microtron and integrating them with existing control system has also been accomplished during this period. Besides, various accelerator machine related accomplishments, the development of multilayer optics using a combination of W/B₄C films for the purpose of soft gamma-ray spectroscopy and measurement of bowing parameter of β -(Al_xGa_{1-x})₂O₃ alloys using an optical reflectivity experiment were also completed.

On the front of development of lasers and employing them for various applications, the Centre has made some noteworthy accomplishments. This includes development of a 1 kW monolithic single transverse mode all-fiber Yb-doped CW fiber laser for industrial applications. A Q-switched Nd:YAG laser based facility for laser-induced breakdown spectroscopy (LIBS) was set up and magnetic trapping of laser cooled ⁸⁷Rb atoms on an atom-chip have also been developed. Other accomplishments include the fabrication of a device based on ZnO nanowires as a positive triboelectric material for vibrational energy harvesting, the development of a laser energy meter based on polymer film (of poly vinylidene fluoride-trifluoroethylene), and the synthesis of densely packed monolayer films of gold nanoparticles as a substrate for surface-enhanced Raman scattering.

The invited *Theme Articles* providing a detailed overview of various R&D activities pursued in the Centre is a regular feature of RRCAT Newsletter. This edition contains four invited *Theme Articles*, which includes one from a HBNI Ph.D. scholar. This article reviews various studies on electromagnetically induced transparency using cold ⁸⁷Rb atoms. The other articles cover topics like pinger magnet system in Indus-2, various power supplies for the lamp-pumped Nd:YAG and diode-pumped fiber lasers, and the development of transition metal Ti-Zr-V based non-evaporable getter (NEG) thin film compatible for accelerator UHV application and Indus-2 undulator.

The Incubation Centre at RRCAT is taking various initiatives to create opportunities for incubation of the technologies developed in the department and to promote technology transfer. To this end, Incubation Centre-RRCAT organized an online workshop titled "Creating Lab-to-Land Ecosystem: Challenges & Opportunities" on August 14, 2021 and also extended the utilization of FBG inscription facility to Indian industries. Design and development of 650 MHz, 40 kW solid state RF amplifier and its shipment to Fermilab, USA is an important milestone towards foreign collaboration. Success of the program to train ITI passed technical personals has encouraged us to extend the same program to the non-technical trades. The first batch consisting of nine apprentices in stenographer and secretarial assistant trade commenced on 1st September 2021 and the fourth batch of TASAR apprentices in technical trades started from 1st October 2021. Centre is also pursuing public outreach activities in a big way to create awareness about Centre's R&D efforts.

I 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. We are highly committed to the development of a clean and green campus at RRCAT, and over the years, a sustained effort has been made to achieve this goal. This achievement has been recognized and appreciated by the Municipal Authorities of Indore city. It is heartening to note that RRCAT colony has been chosen for the "Swachhta Champion Award 2021" for the record fifth time in the category of "Cleanest Colony of Indore".

I sincerely express my appreciation to both out going and the newly constituted Editorial Board for showcasing a wide range of activities of the Centre and bringing out this issue of the Newsletter.

With best wishes,

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S. V. Nakhe
Director, RRCAT