



From the Editor's Desk...

We are happy to bring out the second issue of RRCAT Newsletter of the year 2021, giving a highlight of various activities and events that have taken place in the first half of this year.

The first section reports important achievements made on the accelerator related activities. It begins with the status reports on Indus operations and utilization, followed by a report on a new development of test and simulation setup for Indus control system. Important developments on the front of development of industrial electron linacs for irradiation applications are described thereafter, which includes reports on high power testing of Linac-3, pulse high power microwave system of Linac-3, electron beam sterilization of medical products at ARPF, and Faraday cup electrometer for linacs at ARPF. Important achievement on saturation of lasing in the infra-red free-electron laser (IRFEL) project is described in the next report. This is followed by two reports describing important engineering achievements – one on indigenous development of Titanium to SS316L transition piece for helium vessel of niobium SRF cavity, and another one on investigation of UHV compatible weld joints of AA6061 for vacuum chamber of synchrotron radiation source. Development of a 90 kV, 1 A triode type electron gun is described in the following report. This section ends with a report on probing the electronic density of states in CrSi, using the ARPES beamline at Indus-1.

Important achievements on laser and materials research related activities are highlighted in the next section. This section starts with a report on machine vision based metrology system for inspection of end plates of PHWR fuel bundle, and is followed by a report on recent studies to understand the mechanism of fast electron generation and transport during laser plasma interaction. Important developments in the direction of state-of-art frequency control of lasers is described in the next two reports – the first one on a new polarization enhanced tunable Doppler-free dichroic lock technique, which has been utilised in laser atom cooling experiments, and the second one on development of sub-100 Hz linewidth non planar ring oscillator laser system for gravitational wave detection applications. This is followed by a report on recent development of 50 W Er-doped cw fiber laser at 1600 nm. The next report describes the important development of CO₂ laser assisted automated cutting and sealing set-up for fabrication of tritium-filled self-illuminating glass tubes. This is followed by five reports on materials related R&D – the first one on improvement in mechanical strength of LAM built maraging steel by laser shock peening, the second one on high-dielectric constant TiO₂/Al₂O₃ nanolaminates for next generation energy and data storage applications, the third one on development of γ -ray detector based on GaAs PIN detector coupled with CsI(Tl) scintillator, the fourth one on application of silver phosphate nanoparticles as photocatalyst for developing a solar light driven treatment plant of industrial effluents containing organic dyes, and the fifth one describing the studies on LBMO/P (VDF-TrFE) nanocomposite films for possible use as magneto-electric devices.

The following section describes important achievements related to infrastructure development and services in the form of two reports – the first one on commissioning of a fully automated temperature sensor calibration system for the temperature range of 30 – 1200 °C, and the second one on the integration of ultraviolet – C fixtures in HVAC system for improved air quality.

This issue of RRCAT Newsletter has three Theme Articles. The first Theme Article gives a comprehensive overview of the superconducting RF technology and associated infrastructure development at RRCAT. The second Theme Article brings forward details of the progress that has been made in the direction of setting up of facility for fabrication and characterization of optical components, such as laser rods/slabs, polishing of laser mirror substrates, ultra-thin glass plates and hygroscopic crystal optics, particularly for high energy laser development. The third Theme Article describes the recent studies on indigenously establishing the technology for removal of carbon from mirrors that get contaminated after use in synchrotron beamlines, carried out as a part of the first author's Ph. D. thesis.

'Events and Happenings' section starts with a report on Director's charge handing over ceremony. This is followed by reports on Foundation Day celebrations and National Science Day celebrations. Reports on incubation agreement signed between RRCAT and Tata Motors Ltd, and on technology transfer of high-stability, unipolar and bipolar power converters for electromagnets appear thereafter. Subsequently, a report on 29th DAE-BRNS National Laser Symposium is presented. This is followed by reports on industrial and radiation safety, and fire safety in RRCAT. Regular activities of clean and green campus and staff club are also reported in this section. Further, the reports on accomplishments of our AECS students and our distinguished colleagues, along with various activities carried out for the promotion of usage of Hindi language are included. In this section, we also welcome new members to the RRCAT family and bid farewell to those who superannuated during this period.

The Editorial Board would like to thank all contributors. We would like to express our deepest gratitude to Director, RRCAT, for his keen interest, guidance and active support. We look forward to receive constructive suggestions from readers towards improving the Newsletter content.

With warm regards,

December 6, 2021

Vinit Kumar

Chairman, Editorial Board

(on behalf of RRCAT Newsletter Editorial Board)