Dr. S. V. Nakhe, Director RRCAT, presented an overview of the important scientific accomplishments of the Centre achieved during the past one year. He presented the current status of the synchrotron radiation sources Indus-1 and Indus-2 highlighting, in particular, the new beamlines which have been made operational and also the improvements in the performance parameters of the machine as a result of replacement of bending magnets by the undulator insertion devices. He also briefed about the recent developments regarding Infrared Free Electron Laser (IR-FEL), the only of its kind facility in the country providing an output tunable from 12 μm to 40 μm. Another important milestone mentioned was the successful operation of Electron-beam Radiation Processing Facility, the first such facility in the country, for sterilizing medical products. Dr. Nakhe also elaborated on the contribution of RRCAT in several international collaborations, such as supply of high beta superconducting RF cavities and prototype 40 kW/650 MHz Solid State RF Amplifiers to Fermi Lab under IIFC Collaboration, and supply of power converters for FAIR, Germany. The successful commissioning of Horizontal Test Stand (HTS) for testing the SCRF cavities at cryogenic temperatures was especially highlighted. Several other important accomplishments were also elaborated, which include development of micro-welding workstation for brachytherapy capsules required for cancer therapy applications; development of disc based Nd:Glass amplifiers for use in high energy lasers; development of machine vision based system for inspection of end caps of the nuclear fuel bundles at NFC Hyderabad; development of Agni-Rakshak system based on FBG sensors; deployment of Onco-Diagnoscope in several medical camps for screening of population for oral cavity neoplasia. He informed that Onco-Diagnoscope would soon be deployed in Life-Line Express, which is a hospital on a train, and also in the mobile Health-Van being developed at IGCAR under the leadership of Dr. B. Venkatraman. Dr. Nakhe also described the activities of the RRCAT Incubation Centre, such as the transfer of technology of liquid nitrogen based refrigeration system, named SHIVAY (Shital Vahak Yantra), to Tata Motors Ltd., and FBG based sensors technology to IISc, Bengalore based start-up, Lab-2-Market, for use in railway safety applications. He concluded by emphasizing that R&D institutes, academic and industry working together with innovative ideas can write success stories for Atmanirbhar Bharat.

Another highlight of the Foundation Day function was the technology transfer ceremony, where three biophotonics based technologies developed at Laser Biomedical Applications Division of RRCAT were transferred to Indian industry. These include; (i) OncoVision, a low cost fluorescence imaging tool for enhanced visual identification of malignant and potentially malignant lesions of oral cavity, (ii) TuBerculoScope, a low cost and an easy-to-use, compact and portable fluorescence imaging instrument intended for point-of-care sputum microscopy for rapid detection of Mycobacterium tuberculus (the bacteria responsible for TB disease), and (iii) Raman Probe, a hand-held opto-mechanical module for in-situ measurement of artefact-free Raman spectra from low Raman active materials like biological tissues. While the technology of Onco Vision was transferred to M/s Applied Optical Technologies Pvt. Ltd., Thane, the technologies of Tuberculoscope and Raman probe were transferred to M/s Research India, Bhopal.

Director, RRCAT presenting the technology transfer documents to Shri C. K. Patel, M/s Research India, Bhopal.

Dr. Venkatraman, the Chief Guest of the function, delivered a motivating and engrossing talk to the staff members of the Centre. He congratulated RRCAT fraternity for its stupendous scientific and technological accomplishments achieved during the past one year under the leadership of Dr. Nakhe. He urged everybody to introspect, and devise ways to ensure that the technological innovations being brought out from DAE Centres reach every corner of the society. In this direction, he suggested to organize a two-day brainstorming theme meeting involving RRCAT-IGCAR scientists/engineers, to identify areas of collaboration, where rigorous efforts could be channelized. He further suggested that all DAE Centres should strive to become Centres of Excellence in some advanced technological areas, in addition to their main departmental mandates. These pockets of excellence could be utilized by the students for their academic pursuits, by scientists for accomplishing the departmental mandates, and by the industry in building their capacity further. He asked younger colleagues to plan in this direction so that a long-term policy could be evolved.

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N.5: National Science Day celebrated at RRCAT under "Azadi Ka Amrit Mahotsav"

National Science Day (NSD) is celebrated in India every year on 28th February to commemorate discovery of the Raman effect by Prof. C. V. Raman who was awarded Nobel Prize in Physics in the year 1930 and Bharat Ratna in 1954. Each year RRCAT celebrates the NSD by holding an open house for the school and college students, teachers, family members and guests of RRCAT staff members and invitees from the

public. Over the years, this event has become extremely popular among the school and college students, teachers, as well as the general public. However, this year due to the prevailing COVID-19 pandemic situation, RRCAT celebrated the National Science Day - 2022 (NSD-2022) in an online mode under the "Azadi Ka Amrit Mahotsav". Students and teachers of schools and colleges were invited to join the online virtual program for celebration of National Science Day at RRCAT. More than 650 students and teachers of 42 schools and 12 colleges from Indore and nearby cities joined the online program. In addition, live streaming of the whole program, for a duration of more than 5 hours, was arranged on YouTube, so that more students, teachers, RRCAT and DAE employees, their family members, and special invitees could take benefit of the program from their home, school, college or office. More than 2100 visitors viewed the NSD-2022 program on YouTube. The function was compared by Dr. Mangesh Borage. To begin with the celebration, Shri Rajesh Arya, Chairman, Public Outreach Committee and Convenor, National Science Day (NSD-2022) Organizing Committee brought out the importance of curiosity in the students and innovations in his opening remarks delivered in Hindi language. He also advised students to remain inquisitive and innovative. Dr. S. K. Majumder, Co-convenor, National Science Day (NSD-2022) Organizing Committee welcomed the participants and formally introduced Dr. Shankar V. Nakhe, Director, RRCAT, to the participants on this occasion. He informed participating students that the NSD is celebrated to commemorate the path-breaking discovery of Raman Effect and also elaborated on the importance of celebrating National Science Day.

Director, RRCAT addressed the participants and informed them about the theme for this year for National Science Day, which is "Integrated Approach in Science and Technology for Sustainable Future". He also explained the importance of this theme and emphasized importance of integrated approach to enhance the speed of development. He explained this year's theme of NSD in an interesting manner by citing the approach adopted by the Indore city in using advanced S&T methods for "sustaining the cleanliness of Indore in environment friendly and economic manner". He further elaborated that several projects carried out at RRCAT have implemented this year's theme of sustainable development in true letter and spirit. He brought out the achievements of Indian scientists of ancient and recent times. The recent major achievements of RRCAT in different areas were also very briefly mentioned. He gave an overview of Laser and Accelerator activities being pursued at RRCAT and explained several applications. A few short movies depicting importance of hygiene and cleanliness were also shown in the beginning of the program to drive home the message of "Swachch Bharat Abhiyan" to the participants.

Expert panel and the organizing team of the program.

The participants of NSD-2022 were shown an online tour of various laboratories and scientific activities of RRCAT through video clips on exhibits and technologies developed at RRCAT. The video session of about 120 minutes covered five broad topics, which included Raman Effect and biomedical applications of laser, laser science and technology, accelerator science and technology, science and technology of cryogenics, superconductivity and advanced manufacturing. Videos on each of the topic preceded with a commentary by an expert explaining the technology for the benefit of the participating students and other participants. The video session included the video clips on synchrotron radiation sources (SRS) Indus-1 and Indus-2, infrared free electron laser (IR-FEL), electron beam radiation processing facility, Raman Effect, Raman probe, Onco-DiagnoScope, TuBerculoScope, Neel Bhasmi, how to make laser i.e., basics of laser, laser cutting, laser marker, paint removal by laser, laser surface texturing, laser additive manufacturing, artificial cloud formation, Sheetal Vahak Yantra (SHIVAY), superconducting maglev train, computer numerical control (CNC) lathe machine, water jet cutting machine, demonstration of glass blowing, etc. and also on the experiments set up to explain the basic principles of physics, technologies and cryogenics. The major highlight of the celebrations was the online interaction session of the school and college students with the panel of experts involving senior scientists and engineers of the Centre, who answered the queries of the students related to science, technology, engineering and medicine. The students interacted with the expert panel of RRCAT by communicating their questions through chat-box as well as live online interaction. The interaction session of about 150 minutes received overwhelming and enthusiastic response from the students. A separate interactive online session was conducted for about 40 specially abled students (hearing and speech impaired), who interacted with the Director and other experts. Experts tried to address their queries with the help of interpreter-teachers available at the special school during the interaction session of about 45 minutes. The overall response of specially abled students was extremely enthusiastic as demonstrated by the number of queries they put during the interactive session.

Enthusiastic participation of specially-abled students in online interaction session with the expert panel.

The NSD-2022 program was highly appreciated by the participants, as was clear from the feedback messages received from the teachers and the students. The function ended with the

concluding remarks of the Director, who wished that the proceedings of the day would have definitely ignited the young minds and enticed them to the wonderful world of science and technology. The whole event was managed, under keen supervision of Dr. S. V. Nakhe, Director, RRCAT, by an Organizing Committee with Shri Rajesh Arya as the Convener and Dr. S. K. Majumder as the Co-convener. The committee had made elaborate arrangements for the event with the help and cooperation of a large team of experts, employees, volunteers and security personnel to make the event a grand success.

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N.6: Industrial safety in RRCAT

The Fire and Safety Section of RRCAT is dedicated to ensuring a safe work environment in RRCAT. In order to do this, various safety inspection surveys and qualifying tests are being conducted. Various safety inspection teams are regularly monitoring, reviewing, and ensuring the implementation of various safety-related issues in different labs and buildings of RRCAT.

Illumination and noise survey in RRCAT: Provision for suitable work environment for the technicians is essential for achieving higher production and productivity for workshops, process plant and other manufacturing units. Potential source of noise emission include various machines like compressors, water jet cutting machines, plasma cutting machine, plate shearing machine, etc. Wherever possible such source should be muffled by suitable arrangement. Since poor lighting and noisy condition have negative effects, repeated and prolonged exposer to excessive noise level may lead to hearing impairment and also other related problems like lack of concentration, irritation, headache, etc. In order to access the status of illumination and noise levels, a regular systematic illumination and noise level survey in various relevant area of workshop and labs is being conducted by Fire and Safety Section of RRCAT.

Noise level survey in workshop.

Issuing of height passes for construction labour: Safety precautions need to be taken, while working at height to prevent any accidents. A person working at height has to undergo height pass test. In the first stage, contractor obtains medical certificate issued by qualified doctor, which includes a medical test of the person who has applied for height pass and sequentially it is verified by RMC doctors. In the second stage, this person walks on a platform at certain height and also qualifies the rope climbing test. After qualifying all the stages, height pass is issued.

Photograph during physical test for issuing of height passes to construction labour.

Along with this, regular and vigilant safety inspections are undertaken. In RRCAT, various safety inspection teams, which include Internal safety inspection teams, Safety review sub-committees for EAG, PAG, LG, MSG, TDSG, and Apex Safety Committee (ASC) are regularly monitoring, reviewing, and ensuring the implementation of various safety-related issues in different labs and buildings of RRCAT.

For Internal Safety inspections, two teams are working. Team A conducts safety inspections of accelerator buildings and Team B inspects laser laboratories and buildings. Team A ensured that various safety aspects like radiation fields and other hazardous factors in accessible areas were within the relevant regulatory stipulated limits and no one remained trapped or was present inside the areas with high radiation fields during operation while the primary particle beam was switched on. There was protection against noxious fumes and gases that might be formed during the accelerator beam operation or in radiation processing of materials and an efficient fire protection system was also in place. Similarly, Team B ensured safety aspects related to lasers like sufficient availability of laser safety goggles for eye protection, proper alignment of beams and optical components, etc. A Construction Safety Committee is also working to look into safety concerns at construction sites. This Committee ensured that every worker who was involved at construction site was trained to use Personal Protective Equipment (PPE), like full body harness, helmet, shoes and gloves, etc. This Committee also conducted physical test for the labours, working at height and height passes were issued to the successful candidates. All other safety review sub-committees at RRCAT checked the safety issues related to design, modification, operation and maintenance works, etc., and gave recommendations to improve safety features and ensured the compliance for