

The invited talk sessions had ten talks by eminent experts in the field of control and instrumentation from major Indian institutes involved in the development of particle accelerators. The various topics covered were related to control and instrumentation including SCADA system, embedded system design and development, beam diagnostics & related instrumentation, application of AI/ML in control systems, precision timing and synchronization system and, development of detectors and sensors and ASICs for particle accelerators. The meeting was concluded with a panel discussion in which panellist highlighted importance of documentation and suggested for initiation of V&V process. The meeting was attended by more than 130 registered participants from various DAE units and academic institutes along with invited guests and senior officials of RRCAT. This theme meeting has generated a lot of enthusiasm among the participants and generated collaboration possibilities among institutes on various aspects of control and instrumentation for particle accelerators and in particular for development of detectors and sensors using ASICs. This meeting will serve to foster better networking among participants for realization of robust control and instrumentation systems for particle accelerator projects.

Reported by:
R. K. Agrawal (ragrawal@rrcat.gov.in)

N.6: National Science Day Celebration at RRCAT

National Science Day (NSD) is celebrated in India on 28th February of each year to commemorate the 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. RRCAT celebrated the National Science Day on last Saturday and Sunday of February 2023 i.e., on 25th and 26th February by holding an open house for the school and college students, teachers, family members and guests of RRCAT staff and invitees from public. The theme of this year's National Science Day was "Global Science for Global Wellbeing".



Dr. S. V. Nakhe, Director, RRCAT addressing the students during celebrations of NSD-2023.

On Saturday, February 25, 2023, students of Class XI and teachers from schools in and around Indore, were invited for a full day visit. About 850 students and teachers invited from 57 schools of Indore and nearby places visited RRCAT. The program started with an address by Dr. S. V. Nakhe, Director, RRCAT on the basics of Raman Effect and working principles of accelerators and lasers, which are the main areas of research and development at RRCAT. His lucid explanation in simple Hindi language was very much appreciated by the students and the teachers. A few small movies depicting importance of hygiene and cleanliness were also shown to students and teachers under "Swachha Bharat Abhiyaan".

Special arrangements were made for the Hearing and Speech impaired students invited from special schools to participate in the celebrations accompanied by interpreter-teachers. Director, RRCAT, along with senior members of organizing committee, interacted with about 50 special students in a separated interactive session and tried to address their queries with the help of interpreter-teachers. The students participated actively in this interaction session.

After the address, all the students were taken to exhibit places at laboratories and RRCAT Convention Centre, in organized groups, under the guidance of RRCAT volunteers.



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

There were working exhibits on lasers like use of light and lasers for biomedical applications, demonstrations on applications of lasers like: laser cutting and marking, laser additive manufacturing and Nd:YAG and fibers lasers, etc. To explain some basic science concepts, special experiments had been set up like Raman effect, Michelson interferometer, glow discharge, laws of motion, gas laws, conservation of momentum, change in physical properties of materials at low temperature, etc. To explain some technological applications, live demonstration with models of superconducting magnetic levitated trains, Agni-Rakshak, CNC machining, induction heating, glass blowing, etc. were shown. Videos on Indus Synchrotrons and their uses, development of superconducting radio frequency cavities, indigenous 10 MeV linear accelerator, optical diagnosis of cancer, laser additive manufacturing, laser cutting, detection of RF and microwave signals, etc. were shown.



Students visiting exhibits at RRCAT laboratories.

About 40 exhibits related to technologies of accelerators, lasers, cryogenics, superconductivity, RF and microwave, magnets, along with demonstration of Fire & Safety aspects were set up at RRCAT Convention Centre and in different laboratories to explain the scientific and technical activities of RRCAT as well as to demonstrate a few concepts in basic sciences and engineering.

Important scientific achievements and in-house technological developments were showcased, with emphasis on “Make in India”, with the help of illustrated posters, working models, and actual components. These included instruments like TuBerculoScope, Raman Probe, OncoDiagnoScope, Agni-Rakshak, laser micro welding machine for brachytherapy sources and development of laser technologies related with maintenance of Indian PHWRs, diode pumped laser marker, technology for LN₂ based REEFER, SCRF cavity, superconducting corrector magnets, solid state RF amplifier, high stability power converters, glass-tube based sealed-off CO₂ laser, crystal growth, fiber Bragg grating (FBG) sensor, UV-NIR laser beam visualizer and machine for fiber polishing, etc., which greatly enthused the young visitors.



Visitors experiencing an interesting demonstration on laser cutting.

The overall response of the students and teachers was very enthusiastic showing keen interest in the exhibits and had

lively discussions with the RRCAT officials. Exhibits like demonstration of laser cutting, magnetic levitated train, shaping glass using glass blowing technique, artificial cloud creation by liquid nitrogen and live demonstration of fire-fighting created a vivid impact on young minds and earned applause from students, teachers, family members of staff and guests.

An “Ask-a-Question” event was organized for the students with an aim to create an opportunity for free discussion between these young minds and the working scientists. Several RRCAT scientists interacted with the students encouraging them to ask questions. The discussions ranged from questions arising out of the exhibits at RRCAT for Science Day to basic scientific concepts. The event also encouraged the accompanying teachers to discuss their problems in teaching particular concepts of science. Participation prizes were also given to curious students. The specially-abled students also visited various laboratories and took part enjoyably in “Ask-a-Question” event with great enthusiasm.



Students visiting exhibits at RRCAT Convention Centre.

All the students and accompanying teachers were offered refreshments and lunch in the morning and noon, respectively. Souvenir caps were also distributed to all the students and teachers. Buses were arranged for movement of the students to various exhibits and labs. The overall response of the students was extremely enthusiastic as demonstrated by the number of queries they put in during the visits to the exhibits and at the “Ask-a-Question” event. They went back full of admiration for the scientific activities being pursued by DAE in general, and RRCAT in particular. They were also impressed by the cleanliness, greenery and lakes in the RRCAT picturesque campus.

On Sunday, February 26, 2023, family members and guests of RRCAT staff, college students, and invitees were given opportunity to visit RRCAT laboratories. More than 3000 persons including about 750 college students and teachers visited the laboratories and expressed their happiness on getting an opportunity to learn about the important R&D activities being carried out at the Centre.

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 for the event. The committee had made quite elaborate arrangements for the event with the help and enthusiastic cooperation of a large team of volunteers, exhibitors, administrative staff, and security personnel. The event was covered by different major national and state level newspapers.

Reported by:
Rajesh Arya (rajarya@rrcat.gov.in)

N.7: Industrial and radiation safety activities in RRCAT

Fire and Safety Section, RRCAT is taking care of the safety compliance for the improvement of safety culture among the staff members. Different safety activities are being carried out to meet the said objectives.

Periodic inspection and maintenance of breathing apparatus sets: Every month, the inspection of breathing apparatus sets, which are kept in different labs of the RRCAT technical area is carried out to check their healthiness. The main features include checking of face mask, warning whistle, air pressure, harness assembly, low and high pressure hose, pressure gauge, pressure reducer, back plate and cylinder valves in each assembly. Wherever a fall in pressure in the cylinder is observed to be less than the permissible limit, it is topped. A total of 30 numbers of breathing apparatuses are installed in different buildings of the RRCAT technical area and two sets are also kept in the Agricultural Radiation processing Facility (ARPF).



Inspection of breathing apparatus set.

Noise & illumination measurement: Fire & Safety Section is regularly conducting sound level measurement tests in various buildings of RRCAT. The sound level have been measured quarterly. Measurement of sound produced by various

machines and their sub-systems at different places of RRCAT like Workshop-A & B, LCW & Power Conditioning Unit, etc. for occupational safety of employees working at noisy area was done. Wherever sound level is more than permissible limit, concerned employees have been suggested to use proper PPE. Wherever sound level is very high, employees are suggested to use various engineering control methods like damping, isolation & machine guards, etc.

Similarly illumination measurements are done as per the guidelines set in Atomic Energy Factory Rules - 1996 and corrective measures are taken to improve the observed deficiencies, if any. Illumination measurements have been carried out at various labs of RRCAT with the help of digital lux meter -Lutron Lx-101A.



Noise and illumination survey in DMTD.

Issuing of height passes: RRCAT ensures the safety of the employees and workers working at height. For this purpose, height pass test were conducted. Height pass certificates were issued to 06 workers of CSD. Height pass document is prepared and record of issued height pass is also maintained.



Height pass test for workers.