



N.1: RRCAT celebrated 29th Foundation Day

RRCAT celebrated its 29th Foundation Day on Sunday 19th February 2013. Dr. R Chidambaram, Principal Scientific Advisor to Govt. of India & former Chairman, Atomic Energy Commission (AEC) and former Secretary, Department of Atomic Energy (DAE) was the chief guest, and Dr. P D Gupta, Director, RRCAT presided over the function. The programme was started with a welcome address by Dr. P K Gupta, Head, Laser Materials Development & Devices Division and Laser Bio-medical Application & Instrumentation Division. In his address, Dr. P K Gupta reiterated the importance of the day citing various important milestones achieved by RRCAT since its inception. He also apprised of the seminal contributions of Dr. Chidambaram in elevating DAE to new heights.



P D Gupta, Director RRCAT welcoming Dr. R Chidambaram, Principal Scientific Advisor to Govt. of India and Former Chairman AEC & Secretary DAE during 29th Foundation Day celebration.

Following the enriched tradition of Foundation Day celebration, Dr. P D Gupta presented an overview of the scientific activities of the Centre and highlighted the important achievements made during the last year. He said, "Indus-1, the 450 MeV Synchrotron Radiation Source (SRS) has been operating in 3-shift mode satisfactory with five beam lines". He appreciated the contribution of the teams involved. He further said, "Indus-2 has also been operational at 2.5 GeV Energy/ 100 mA current in 3-shift mode. Recently, its operation has been enhanced to 2.5 GeV Energy/ 150 mA current. With the installation of three more beam lines, total nine beam-lines of Indus-2 are available to researchers from the universities, research institutes and national laboratories. He informed, "The failure of two klystrons and difficulties faced due to non-availability of klystron for replacement had restricted the operation of Indus-2 to 2 GeV, 100 mA.

Subsequently, task of developing new technology of solid-state amplifiers was taken up and today we have developed and deployed solid state RF amplifiers delivering 180 kW power at 505.8 MHz to substitute for klystrons. The round the clock mode of operation of these solid state amplifiers has increased our confidence and self-reliance to take up large accelerator projects. Talking about the availability of beam lines for state of art work, he informed, "ISRO scientists are working with us to calibrate their ultraviolet spectroscopy payload using High Resolution Vacuum Ultra Violet Beamline on Indus-1." Indicating the productivity of various research activities using Indus beam lines, he informed that a total of 66 publications appeared in international journals and conference proceedings during 2012. Citing the importance of Proton Linac Programme of RRCAT, he said, "Pulsed Proton Linac of 1 GeV energy, 1 mA average current for Spallation Neutron Source (SNS) is an intermediate step towards a CW proton accelerator required for Accelerator Driven System. Knowing the importance of superconducting radio-frequency (SCRF) science and technology in this project, necessary infrastructure for SCRF cavity fabrication and characterization is being setup. This year a 5-cell 1.3 GHz Niobium cavity has been fabricated and it is being sent to Femilab for processing and testing its performance. Also, a single-cell 1.3 GHz Niobium cavity has been fabricated using a fiber-coupled Nd:YAG laser. Vertical test stand and cryomodule component test rig are important developments for the testing of SCRF components." Describing the development work of Compact Ultrafast Tera Hertz Free Electron Laser (CUTE-FEL), he said, "The peak accelerated electron beam current in CUTE-FEL is increased to 15 A and measured bolometer signal corresponds to a photon flux of $\sim 6.6 \times 10^{11}$ photons/s, which is more than 100 times the expected spontaneous emission." Discussing the development of Master Oscillator Power Amplifier (MOPA) chain of Copper Bromide lasers, he informed the gathering that a MOPA setup of the 3 copper bromide lasers had been developed and average laser power of 110 W was obtained. He also briefly discussed about the successful development of a 14 W CW Nd:YAG laser for indigenization of laser radiator of missile firing system of T-90 tank and told that the developed laser had been tested at Opto-Electronics Factory, Dehradun and it met military standards. Briefing the new developments in laser rapid manufacturing (LRM), he informed that a LRM processing head for the deposition of inner vertical surface of pipes had been developed and it was deployed for the cladding of Ni-based alloy T700 layers. Discussing about the laser driven electron acceleration, he said, "Laser wake field electron acceleration can provide very high accelerating fields of 300GV/m as compared to only 20-30MV/m by using standard RF technology. Mono-energetic electron beam has been generated in pre-formed plasma plumes (instead of conventional gas jets) using laser wake-field acceleration." Besides describing other important

achievements during last year, he also discussed about Bose-Einstein condensation in Rb87 atoms in a double magneto optic trap setup at $T = 1^\circ\text{K}$, $n = 1013/\text{cc}$ and $N=106$ atoms with a life time of 14 second. He further told that an LED-based diagnostic system was developed for detection of oral cavity cancer. This system is more compact, rugged and maintenance-free compared to the N2 laser based systems used earlier. Photon counting version of uranium fluorimeter was developed with detection limit 0.02 ppb and measurement range up to 50 ppb. The developed fluorimeter is under field evaluation at BARC. A gated grid S-20 optical streak camera was developed and tested in Indus-1 SRS by the electron bunch length measurement. Highlighting the upgradation of computing and communication systems, he talked about the commissioning of a high performance computing cluster (Kshitij-3, क्षितिज-3) capable of delivering peak computing power of 9 teraflops. Discussing about the human resource development, he informed that BARC Training School at RRCAT, 13thbatch had 14 Trainee Scientific Officers, while 66 Stipendiary Trainees were being trained under Stipendiary Training Programme. Number of PhD and M Tech registration under Homi Bhabha National Institute was 97 and 67 respectively.

In the chief guest address, Dr. R Chidambaram expressed his happiness over the progress made by the scientists, engineers and the supporting staff of RRCAT in the areas of lasers, accelerators and related advanced technologies. Reiterating the importance of the advanced technologies being developed at RRCAT, he added, "Inputs from advanced technologies into equipment are needed for doing what today one calls "Bigscience". Accelerators and research reactors; synchrotron radiation sources like Indus-1 & 2, optical, radio and gamma ray telescopes; neutrino observatory; and so on. These are Mega-Science projects at one end of the spectrum." He praised the round the clock operation of Indus-2 and the enthusiasm shown by the researchers from the various universities and national laboratories on utilization of Indus SRS facility. He praised that the work related to enabling technologies and focused R&D efforts taken up at RRCAT in the development of accelerator system for SNS. Sharing the vision, he said, "Research involves generation of new knowledge and innovation requires adding economic value (or societal benefit or strategic value or a mix of them) to knowledge, even knowledge not generated by you. The border between applied research (& also what I call "directed basic research") and innovation, when developing cutting-edge technologies, becomes fuzzy."

Dr. S M Oak, Head, Solid State Laser Division proposed the vote of thanks. The Foundation Day programme was conducted by Sh. S C Joshi, Head, ProtonLinac& Superconducting Cavity Division.



Gathering at Central Complex Auditorium during 29th Foundation Day celebration

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N.2: National Science Day at RRCAT

National Science Day (NSD) is celebrated every year on the last Saturday of the month of February at Raja Ramanna Centre for Advanced Technology, Indore. This year, it was celebrated on 23rd February 2013. 1500 students and teachers of 111 schools and colleges from Indore and some from faraway places came to visit the scientific facilities in RRCAT. The staff members of RRCAT had prepared about 15 exhibits which were kept in 12 buildings to explain the scientific and technical activities of the Centre and to demonstrate a few concepts in basic sciences. In the main function at RRCAT auditorium, Shri H S Vora, Convener NSD-2013, welcomed the students and teachers. He invited Dr. P D Gupta, Director RRCAT to inaugurate NSD-2013 and address the gathering. Dr. Gupta informed that the National Science Day is celebrated to commemorate the path-breaking discovery of Raman Effect which led to the winning of Nobel Prize by Prof. C.V. Raman. Dr. Gupta brought out several inspirational aspects of Prof. Raman's personality and life-style besides his scientific contributions. Dr. Gupta also described the growth of Indian Science in the last few decades and the contribution of the Department of Atomic Energy in the enhancement of Science and Technology capabilities of our country. He also gave an overview of Laser and Accelerator activities at RRCAT and explained several applications. His simple and easy to understand explanations had a stimulating effect on the students and teachers. He also encouraged the students to take up the scientific research as career and briefly explained its relevance in national and international context. Shri Rajesh Arya, Co-Convener NSD-2013, presented vote of thanks.