N.3: Theme Meeting "Indigenous technology development for synchrotron x-ray mirrors"

A one day theme meeting on "Indigenous technology development for synchrotron x-ray mirrors" was organized on 28th June 2014 at RRCAT, Indore with the financial supports from BRNS and the office of the Principal Scientific Adviser to Government of India. The meeting was attended by about 60 persons of which, about 21 were outstation participants from various IITs, CSIR-CSIO, DRDO lab and BARC and the rest represented the ISUD and other divisions of RRCAT.

The objective of this meeting was to harness the scientific talent and technical expertise available within the country to develop indigenous technologies for synchrotron x-ray mirror fabrication. This meeting was also expected to mark the beginning of a national level collaborative interaction among the various experts in the field of fabrication and metrology of optical components with high surface form/figure accuracy and sub-nanometer surface roughness suitable for use with synchrotron x-ray radiation.

The meeting was inaugurated by Dr. P. D. Gupta, director, RRCAT, Indore. He emphasized the importance and the need to take up the challenging task of developing indigenous technology for synchrotron mirror fabrication through collaboration amongst various national laboratories and institutes. The importance of this technology development was also emphasized in the context of the future high brightness synchrotron source planned in the country. Dr. G. S. Lodha and Dr. M. H. Modi presented a detailed overview of the synchrotron x-ray mirrors, their critical specifications and the associated technological challenges for undertaking this development program. This was followed by an interactive visit to the Indus-1 and 2 beam lines. The participants were explained the use of various types of x-ray optics deployed in the beam lines to deflect, collimate, monochromatize and focus x-ray radiation. In the post lunch session, scientists/researchers from various institutions delivered brief presentations based on their respective core competence and expertise, how and in which area they could contribute effectively for the x-ray mirror development program. The presentations were coordinated by Prof. V.K. Jain (IIT, Kanpur) and Dr. V.K. Suri (Precision Engineering Division, BARC).

At the end of the individual presentations, a panel discussion was held to draw the roadmap for indigenous technology development for synchrotron x-ray mirror fabrication through participations of various national institutes and laboratories in goal oriented and time-bound technical projects in order to meet this challenging objective within the next five years.

Air travels of some of the outstation non-DAE participants, expenses for providing local hospitality for this theme meeting and other contingency expenditures were met from the fund provided by the BRNS. The generous support of the BRNS and Office of the Principal Scientific Adviser, Govt. of India is gratefully acknowledged.

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N.4: School on "Basics of Magnetism and Investigations of Magnetic Properties of Materials using Synchrotron Radiation"

A School on "Basics of Magnetism and Investigations of Magnetic Properties of Materials using Synchrotron Radiation" was held at RRCAT during March 24-28, 2014. The programme of the school included pedagogical lectures on magnetism, surface/bulk magnetism, resonant magnetic scattering and dichroism.

Dr. P. D. Gupta, Director, RRCAT, presided over the inauguration function. Dr. Gupta in his inaugural address, informed the participants that a series of focused theme meetings were being organized to promote the utilization of Indus Synchrotron facility by increasing the user base in the country. Dr. G. S. Lodha, Convenor of the school, and Head, Indus Synchrotrons Utilization Division, RRCAT welcomed the delegates, invited speakers, students and invitees attending the function and also gave an overview of various beamlines on Indus synchrotron radiation sources.

The first lecture was delivered by Prof. A. K. Majumdar. Through his series of seven lectures, he covered Basics of magnetism to advanced topics in magnetism. Prof. Ajay Gupta concentrated on magnetic thin films and multilayers through series of four lectures. He explained various issues related to layered structure magnetic system using x-ray scattering. He also explained the structure-properties correlation in magnetic thin films and multilayer structures. Dr. Alok Banerjee explained the basics of X-ray Magnetic Circular Dichroism, sum rules in dichroism and understanding of the magnetic characteristics using this technique. He also presented some illustrative experimental results. The lectures of Prof. K. Priolkar concentrated on Extended X-ray Absorption Fine Structure analysis for local structure determination. The structure-property relation is an important aspect for progress in understanding of basic magnetism and development in magnetic materials. He

explained various issues related to EXAFS for extraction of accurate local structure starting from simple to complex structures. Prof. J. R. Mohanty covered a new technique of magnetic imaging using synchrotron. He also covered coherent magnetic scattering to study ultra-fast magnetism on small time and length scales. Prof. D. K. Satapathy covered basic principles behind determination of magnetization profile in layered structures using soft x-ray resonant magnetic reflectivity. He explained the various issues related to magnetization using this technique through representative results on promising oxide magnetic multilayers. Dr. D. Shukla presented the results of magnetic x-ray diffraction and Dr. M. Nayak presented some recent studies on spatially and chemically resolved atomic profile of low contrast interfaces using non-magnetic resonant x-ray scattering. The overview of results and current activity of different existing beamline related to the topic were presented by respective beamline scientists: Dr A. K. Sinha, Dr. S. N. Jha, Dr. D. M. Phase, Dr. M. H. Modi, and Dr. M. K. Tiwari for beamline of ADXRD, EXAFS, PES, Soft x-ray reflectometry and XRF-microprobe respectively.

More than 40 outside participants from various universities and national institutes from different universities and institutions in the country attended the school. A major aspect of the school was the extensive interaction that the students had with the faculty members specifically with Prof. A. K. Majumdar. A feedback session was also held at the end of the school. All the participants were thoroughly satisfied with the school.

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N.5: Young Scientist Research Program (YSRP) at RRCAT

The Young Scientist Research Program (YSRP) for the year 2014 was organized at RRCAT during May 12, 2014 to July 04, 2014. This research program is organized in the summer vacations to expose young students to various R & D activities in front line areas of science and technology. Ten meritorious students, who were selected from all over the country, were provided free accommodation at RRCAT Guest House and paid round-trip train fare by II class (sleeper) and a stipend of Rupees 2,500 per month. The students got an excellent opportunity to work on projects under the guidance of leading experts of the country. The research projects, which were allotted to the students during their 8 weeks stay at the Centre are listed below along with the names of the guides:

Student	Title of the project	Guide
Akshay Joshi, SPSU, Udaipur	Investigation of impact of multicore processors on performance of high performance computing cluster	Mrs. A. Rajan, CD
Ashish Awasthi, ISM, Dhanbad	PXI based data acquisition and control system for beamlines	Mr. S. R. Kane, ISUD
Apoorva Pachori, JEC, Jabalpur	Development of an OTP - based user authentication system	Mr. A. Jain, CD
Pranauti Deshmukh, GHRCE, Nagpur	Participation in design, development and testing of a 100W, L-band RF amplifier	Mr. P. Mohania, PHPMS
Ravi Ranjan Bhardwaj, NIT, Patna	Design and thermal analysis of photon beam dump for insertion devices (undulators) based beamline front ends and safety analysis of dipole chamber	Mr. V. Prasad, ISUD
Rajshree Khare, IET-DAVV, Indore	Study and implementation of internet traffic diversion technique based on white list	Mrs. S. Chaudhari & Mr. H. Chouhan, CD
Rishabh Gupta, IT, GGU, Bilaspur	Study and implementation of network access control	Mr. A. Bansal, ACBDD
Siddharth Varshney, IIT-BHU, Varanasi	Reliability analysis of power electronics building blocks	Dr. M. Borage, PSIAD
Subodh Rana, NIT, Jamshedpur	To study the effect of annealing on hardness and impurity distribution of high purity niobium	Mr. A. Bose PLSCD
Yennapureddy Manoj Kumar, RGUKT, Kadapa	Study and characterization of femtosecond laser pulses using autocorrelation technique	Dr. A. K. Sharma, LPD

Under this research program, six interaction sessions cum seminars were delivered by senior scientists/engineers of RRCAT. These seminars, which were open to Ph. D. students and other trainees also, are listed below:

- "Accelerator, laser programs and related technologies at RRCAT" by Shri Purushottam Shrivastava, PHPMS
- "An introduction to synchrotron and synchrotron radiation sources" by Shri Amalendu Sharma, IOAPDD
- "Synchrotron radiation: A powerful electromagnetic source" by Dr. G.S. Lodha, ISUD