

SAHAYOG



UGC-DAE CONSORTIUM *for* SCIENTIFIC RESEARCH

An autonomous Institution of the University Grants Commission

Vol.16 No.2

UGC-DAE CSR Bulletin

November 2007

Online at www.csr.ernet.in

Workshop on “Characterization of Nanostructured Systems”

(June 14-16, 2007, Department of Physics, University of Mumbai)

The Mumbai Centre of UGC-DAE Consortium for Scientific Research together with Physics Department of University of Mumbai organized a three-day workshop on “Characterization of Nanostructured Systems” at Kalina Campus of University of Mumbai during June 14 – 16, 2007. The objective of this workshop was to create awareness among the scientists from universities / institutions, about various methods and tools to characterize the nanostructures and the kind of information one can extract from them. The participants to this workshop were mainly drawn from universities and colleges in the Maharashtra region. A total of 56 participants comprising 17 faculty members and 39 students from various universities and institutions across Maharashtra participated in the workshop. Out of these, 34 participants were from various colleges/institutions in and around Mumbai.

Prof. Vijay Khole, Hon. Vice Chancellor of University of Mumbai was the chief guest and Dr. P. Chaddah, Director of the Consortium presided over the function. Prof. Sureshchandra J Gupta, Head, Department of Physics, University of Mumbai welcomed the gathering and Dr. Chaddah in his presidential address explained the concept and mandate of the Consortium. Prof. Khole delivering the inaugural address stressed the need to reach out to students and teachers/faculty of not only the university but also its affiliate colleges and other institutions so that they could improve the quality of their research and teaching. Dr. V. Siruguri, UGC-DAE CSR Mumbai Centre, in his address explained the objective of the workshop and briefly described the activities of Mumbai Centre. Following this, Dr. J.V. Yakhmi, Associate Director, Physics Group of BARC, delivered his keynote address. He described the various facets of nanostructures and their applications. Dr. P. D. Babu, CSR Mumbai Centre, proposed the vote of thanks.

The workshop consisted of the following lectures in addition to the Keynote lecture on nanostructures and their applications by Dr. Yakhmi: Role of XPS and XRD in characterizing nanostructured materials (Prof. (Mrs.) S. K. Kulkarni, Pune University), Probing nanomaterials using AFM/STM and facilities at CSR-Indore Centre (Dr. V. Ganesan, CSR, Indore), Brief review of upcoming Nanoscience & Nanotechnology Centre at Kalina Campus, University of Mumbai (Prof. D. C. Kothari, University of Mumbai), Facilities at CSR-Mumbai Centre (Dr. V Siruguri, CSR, Mumbai), Introduction to scattering methods (Dr. P. S. Goyal, CSR, Mumbai), Characterization and



applications of ferro fluids (Prof. R. V. Mehta, Bhavnagar University), Small angle x-ray & neutron scattering studies in nanomaterials (Dr. V. K. Aswal, BARC), Dynamic light scattering and its application to nanostructured systems (Dr. P. A. Hassan, BARC), Preparation and characterization of nanostructures (Prof. M. Sharon, Birla College, Kalyan), Synchrotron studies on 1D nanomaterials (Dr. P. D. Babu, CSR, Mumbai), SEM & TEM studies on nanostructured systems (Dr. N. P. Lalla, CSR, Indore), Raman scattering studies in nanostructured systems (Dr. V. Sathe, CSR, Indore), Semiconductor nanoparticles: characterization by optical spectroscopy and facilities at CSR-Kolkata Centre (Dr. A. Saha, CSR, Kolkata), X-ray and neutron reflectivity from thin films and multilayers (Dr. Mukul Gupta, CSR, Mumbai).

In addition to these lectures, there was a special session to discuss the scientific contributions of Dr. P. S. Goyal. Dr. A.D. Sawant, Pro Vice Chancellor of University of Mumbai was the chief guest for this session. Special invitees Dr. B. A. Dasannacharya, former Director of CSR, and Dr. R. Mukhopadhyay, BARC, participated in the discussion and brought out important contributions made by Dr. Goyal, especially in the field of neutron scattering and small angle scattering in particular. Prof. R.V. Mehta described Dr. Goyal's contribution in the field of ferro fluids and highlighted his role in promoting the activities of CSR Mumbai Centre.

Dr. V. N. Magare, Director, Board of College and University Development (BCUD), University of Mumbai was the chief guest at the concluding session and distributed the certificates to the participants. During the feedback session, the participants appreciated the lectures and also thanked the organizers for excellent local hospitality.

BRNS workshop on Ion Beams at VECC and their Applications in Basic and Applied Sciences

A BRNS workshop on “Ion Beams at VECC and their Applications in Basic and Applied Sciences” has been organized at VECC, Kolkata from September 12 –14, 2007. The workshop was organized to provide a platform for acquaintance and discussions amongst the faculty members from Universities and the teaching institutes about the existing and upcoming programs at VECC in the advanced fields of science and technology for ion beam production and applications. It was intended to help catalyze interaction between Universities, VECC and the Consortium leading to research and developmental activities for the optimal utilization of the large scale research programs of VECC.

The workshop was attended by more than 150 participants (including about 45 outstation participants). The inaugural session of the workshop included addresses by Dr. Bikash Sinha, Dr. R. K. Bhandari, Dr. P. Chaddah & Dr. A. K. Sinha. Dr. Bikash Sinha delivered an Evening lecture covering the exciting range of basic and applied science pursued using the ion beams. Besides laboratory visits and panel discussions, the program included 23 invited lectures and 6 presentations by young researchers.

Dr C Mallik gave a broad overview of the existing room temperature cyclotron and the upcoming Super conducting cyclotron (SCC) being built at VECC. The operating parameters for the room temperature cyclotron with the light ion source and the upcoming super conducting cyclotron facilities were presented so that the users can formulate their research programs accordingly.



The advanced features of the Radioactive Ion Beam (RIB) Project at VECC were described by Dr. A Chakrabarti, VECC. Dr V Naik and Dr A Banerjee of VECC described the RFQ and LINAC facilities for RIB developments at VECC while role of RIBs in nuclear, atomic and materials sciences was covered by Dr A Chakraborti and Dr A Banerjee of VECC. It was pointed out that the low-energy Rare Ion Beams from VECC expected to be available soon has unique applications in material science investigations. The upcoming Medical Cyclotron facility was described by Dr M K Dey, VECC The proton beams from the medical cyclotron could be delivered simultaneously to multiple experimental stations. This will facilitate ion-beam based material modifications and also production of radioactive isotopes. Dr Bhandari suggested that there will be good amount of beam time available for users from this facility. An ECR Ion Source based low energy ion beam facility was described by Dr G S Taki, VECC. The facility is operational and is being upgraded for general utilization from material science users.

Large scale Nuclear Detection Systems spanning charged particles-, neutrons- and low & high energy gamma ray-detection were described in a series of talks from Dr C Bhattacharya (VECC), Dr S R Banerjee (VECC), Mr Kaushik Banerjee (VECC) and Dr S S Ghugre (UGC-DAE CSR). Dr Subhasis Chatterjee gave a talk on the planned FAIR facility in Germany covering Research and Development Opportunities to the Indian research community. He described large detection systems for neutrons and various experimental facilities to carry out nuclear structure studies using the radioactive ion beams from FAIR while pointing out the possible activities for the collaborative projects with universities, VECC & the Consortium. The development of Ion Trap setup for experiments using the SCC and the low energy RIB facility was discussed by Dr Amlan Ray, VECC.

There were extensive discussions on the Materials Science studies using the ion beams of various energies available at VECC. The ion beam induced defect studies relevant to materials in use under heavy radiation doses (such as in nuclear-reactor environment) were described by Dr P. Barat, VECC and Dr P. M. G. Nambissan, SINP. Dr D. P. Chaudhury, VECC outlined the trace Analysis techniques using nuclear reaction with high energy beams. Radio nuclide for material structure studies were discussed in extensive talks from Dr S K Das, VECC who covered Time Differential Perturbed Angular Correlation Technique. Plans of Mossbauer Studies using short lived radio isotopes using the Medical Cyclotron facility were described in a talk by Dr D Das, UGC-DAE CSR.

Dr. H. P. Sharma, Dept of Physics, B. H. U. gave a talk on the accurate mass measurements of exotic nuclei using ion traps and his experience in the field at Argonne National Laboratory at USA. Dr. N. M. Badiger, Dept. of Physics, Mangalore University described the fusion fission studies using heavy ion beams and the role of dynamical hindrance to fission. Dr. Surjit Mukherjee, Dept. of Physics, Baroda University brought out the important features of the incomplete fusion processes which play dominant role in nuclear reactions at higher ion energies available at VECC machines. Dr. Y. K. Vijay, Dept. of Physics, University of Jaipur described various experiments in material sciences using heavy ion beams including nano filters etc.

Planned Nuclear Studies using ion beams from SCC were discussed in details in series of talks. Dr S Bhattacharya (VECC) discussed studies in nuclear collisions around Fermi energy; Dr B R Behera, Panjab University gave an extensive outline of the possibilities of study of deep inelastic and transfer reactions involving heavy nuclei; Dr Satyajit Saha, SINP brought out the role of Megnad Detector array for nuclear reactions studies. Dr. S Mondal, Delhi University gave a talk on "In-flight Gamma ray spectroscopy- techno-scientific challenges" where he described his experimentations at GSI, Germany and brought out the role of segmentation of gamma detectors as a critical need for structure studies using the fast moving exotic residues. Dr A K Sinha (UGC-DAE CSR) described the outline of the large solid angle super conducting solenoid facility (LASS) being built for studies of exotic nuclear species using the SCC ion beams. Dr Gopal Mukherjee, VECC covered nuclear spectroscopy of neutron rich fission fragments while Dr Maitreyi Saha Sarkar, SINP described study of exotic neutron rich nuclei which are expected to be possible with the SCC beams.

The concluding session of the workshop discussed in details many projects that could be undertaken by the university research faculty. There were discussions on the possible degree level projects for various research and developmental programs; including possibility of preparing projects for BRNS funding. Setting up of arrays comprising of highly segmented gamma detectors for gamma ray spectroscopy of fast moving exotic residues and developments related to ion trap were considered important.

Pollution Bio-Monitoring in and around Kolkata – A Trace Elemental Study

N.K.Jana^{}, S.Majumder^{*}, S.Santra⁺, D.Mishra[#], A.Chakraborty[#], M.Sudarshan^{#*}*

^{*} Dept. of Zoology Charuchandra College

⁺ Dept. of Environmental Science, Kalyani University

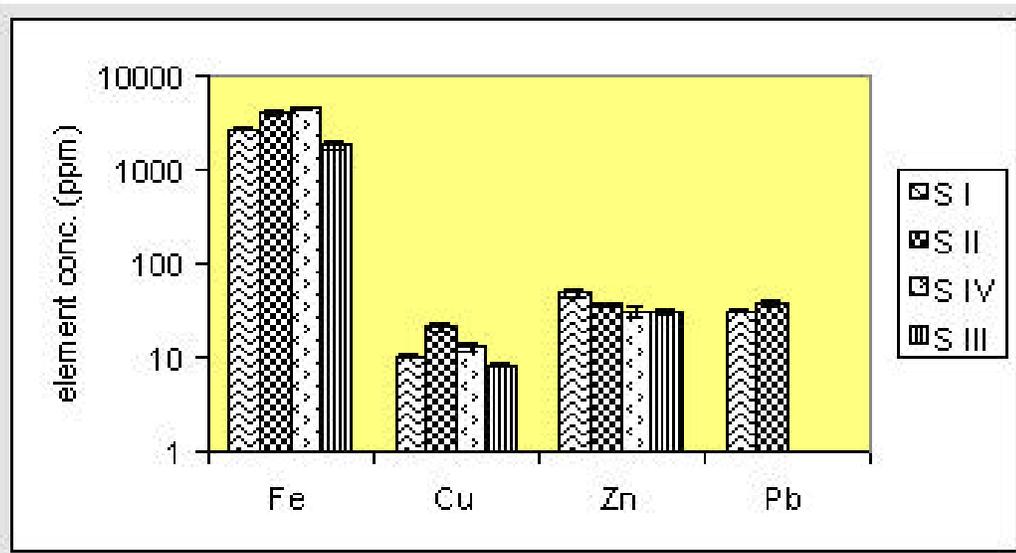
[#] UGC-DAE Consortium for Scientific Research, Kolkata Centre

Under the Trace Element Research Program of the Centre, study of epiphytic lichens as bio-indicators of air quality of Kolkata was taken up as a collaborative research project. These lichens are very responsive to environmental stressors especially gaseous pollutants and particulates including trace elements and heavy metals. The underlying objective of the project was to assess the level of air pollution in the city that has been listed as one of the most polluted cities in the world by recent international environmental survey.

Three sampling sites (SI, SII, SIII) from Kolkata and one site (SIV) from Sundarbans, a mangrove forest region close to the Bay of Bengal were selected for collecting lichens. Salt lake (SI), a residential area in the eastern periphery of Kolkata with moderate traffic volume, Botanic garden (SII) 15 km from Kolkata city, on the west bank of river Ganges close to industrial belt, and Baruipur (SIII), 25 km south from Kolkata city centre, a relatively unpolluted area, are the three sampling sites from Kolkata. Gosaba (SIV) one of the village islands in the Sundarbans 100 km south to Kolkata is chosen as the fourth sampling site with lesser auto-exhaust than that of Kolkata

Trace element analysis of lichen samples collected from these urban and peri-urban sites in and around Kolkata was carried out using PIXE at the 3MV Tandem Pelletron of IOP, Bhubaneswar. Results shown in the figure indicate that lichen (*Parmelia caperata*) samples collected from sites burdened with heavy vehicular load or near to the industrial belt (SI and SII) have significantly higher concentration of elements like Fe, Cu, Zn, Pb as compared to those collected from sites having less or no load (SIII and SIV). It is interesting to note that Pb is not detected in samples from SIII and SIV clearly reflecting contribution of this element from auto-exhausts in the city air. The observed deviations in each sample with respect to the chosen control is more than 3 sigma level (99.9%)

Our observation represents pioneering report of elemental profile of lichen from Sundarbans region and provides baseline information of metal accumulation in the lichen thalli reflecting loading of heavy metals in Kolkata city air.



Site-Specific Variation of Metal Concentrations in Lichen

Seminars by Visiting Faculty at CSR Indore Centre

Speaker	Affiliation	Title	Date
Prof. Murli H. Manghnani	Hawaii Inst Geophysics & Planetology	Recent advances in high P – T synchrotron research	6 Nov 2007
Prof. Francisco Alves	Laboratoire de Genie Electrique de Paris, CNRS-SUPELEC Univ. Paris	Magnetic Sensors and Applications in Non-Destructive Testing and Space Magnetometers	5 Nov 2007
Prof. Marina Andreeva	Dept. Solid State Physics, Moscow State University, Moscow	Standing Waves in Resonant Multilayers	26 Oct. 2007
Dr. Ilya Sergeev	Nuclear Resonance Scattering Group, ESRF, Grenoble (France)	Nuclear Resonant Scattering of Synchrotron Radiation	25 Oct. 2007
Prof. Lesley Cohen	Imperial College, London	Magnetocalorics	06 Oct 2007
Dr. W. Leitenberger	Universität Potsdam, Germany	Application of a pn-CCD in X-ray diffraction - a really three dimensional X-ray detector	03 Oct. 2007
Prof. A.K. Raychaudhari	S.N. Bose NCBS, Kolkata	Controlled Phase Separation in Manganites using STM	26 Sept 2007
Dr. K. Maiti	TIFR, Mumbai	Investigation of Novel Electronic Properties using High-Resolution Photoemission Spectroscopy	07 Sept 2007
Dr. M. Sundararaman	Structural Metallurgy Section, MSD, BARC, Mumbai	Microstructural Evolution and Deformation Behaviour of Lamellar Alloys	06 Sept 2007
Dr. G. Amarendra	Materials Science Division, IGCAR, Kalpakkam	Positron annihilation life time studies of materials	24 Aug 2007
Dr. Shikha Verma	IOP, Bhubaneswar	Scaling Exponents of InP Nanodots Fabricated by keV Irradiation	09 July 2007
Prof. N.K. Verma	Thapar University, Patiala	Synthesis & Characterization of Metallic and Semiconductor Nanostructures	10 July 2007

Visits abroad by faculty and students of UGC-DAE CSR

Name	Place and purpose	Period
Prof. A. Gupta, Indore	Indo – French Project, ESRF, Grenoble, France	12/05 – 12/06/2007
Dr. S. R. Barman, Indore	EXAFS beamline experiments at Trieste, Italy; Int. 2007 MRS Fall meeting, Boston, US	11 – 31/05/2007; 25 – 29/11/2007
Dr. T. Shripathi, Indore	INSA – HAS scientific exchange programme, Budapest, Hungary	12 – 20/11/2007
Dr. A. Chakraborty, Kolkata	ISTERI – NTES-ITES 2007 Conf., Crete, Greece	19 10 – 02/11/2007
Ms. Kavita, Indore	Int. Conf. Material Science and Technology, COBO, Detroit, US	16 – 20/09/2007
Ms. Ranu Dubey, Indore	MPI for Metal research, Stuttgart, Germany	14 – 18/08/2007
Ms. Shilpa Tripathi, Mr. R. Brajpuriya and Mr. A. Sharma, Indore	Training course on synchrotron radiation, Bangkok, Thailand	23 04 – 04/05/2007
Mr. Somsundar Mukhopadhyay, Kolkata	Research visitor, Nuclear Structure Laboratory, University of Notre Dame, Indiana, US.	01 02 – 31/08/2007

Superannuation of Dr. P.S. Goyal,



Dr. P. S. Goyal, Centre Director of CSR Mumbai Centre had retired on May 31, 2007 after serving more than nine years as Centre Director. Prior to joining CSR Mumbai Centre, Dr. Goyal served Bhabha Atomic Research Centre for 31 years. To mark this occasion a function was held on June 4, 2007 at the Modular Laboratories, BARC, Mumbai to felicitate Dr Goyal. During the function several of Dr Goyal's colleagues from BARC and CSR recalled his contributions in the field of neutron scattering and soft condensed matter, and his sustained efforts to promote this technique among the university scientists. Dr. P. Chaddah, Director UGC-DAE CSR and Dr. V. C. Sahni, Director, Physics Group, BARC and Director, RRCAT, Indore were present on the occasion.. Dr. Goyal's work using small angle neutron scattering on a variety of systems including different types of surfactants, micelles, ferro fluids, etc. are internationally recognized. He was mainly responsible for the growth of Mumbai Centre of the consortium and promoting the collaborative schemes on neutron scattering among university community. One of his significant achievements was to spearhead the efforts of the Centre to develop and install a neutron beam line using focusing optics. Details of the beamline are given elsewhere in this issue.

A special session was organized during the Mumbai workshop on characterization of nanostructured systems in honor of Dr. P.S. Goyal, where his scientific contributions were discussed.



New Centre Director for UGC-DAE CSR Mumbai Centre



Dr. A. V. Pimpale has taken over as Centre Director of the Mumbai Centre of UGC-DAE CSR on Nov, 1, 2007. Dr. Pimpale has been with the Consortium (formerly IUC-DAEF) since March 1991. He is a man of x-ray spectroscopy with varied interests in theoretical physics, neutron scattering and condensed matter physics.



Dr. Archana Lakhani joined the Indore Centre of CSR in August, 2007. She did her Ph.D. at UGC-DAE CSR Indore during 1997-2004 under the supervision of Dr. V. Ganesan. Her Ph.D. work was on transport properties of highly correlated electron systems at ultra low temperatures using Dilution Refrigerator. She was a Post Doctoral Fellow at Institute for Plasma Research in 2005-06 and worked as Cryogenic Engineer at Oxford Instruments, Oxfordshire, UK. She received M.P. Young Scientist Award in 2006.

वि.सं./2007 दिनांक : 21 सितम्बर 2007

परिपत्र

वर्ष 2007 में 'हिन्दी दिवस' के अवसर पर इस संस्थान द्वारा भौतिक विज्ञान क्षेत्र सम्बन्धी विभिन्न आयोजनों का आयोजन किया जाकर निम्नलिखित हुआ है :-

आयोजन विषय	प्रकार	समय	दिनांक
'विश्वेद्वीप कवित्त अंतर-उपखंडी उपखंडीकरण'	डा० राजेश जी. नंदेकर	पूर्वाह्न 10 बजे से 10.45 बजे तक	26 सितम्बर/07
'शैली परम्परा में रचना प्रकाश'	डा० मनीष जी. खड्गे	पूर्वाह्न 11 बजे से 11.45 बजे तक	25 सितम्बर/07

आयोजन इस संस्थान की 'विश्वेद्वीप' में शैली, प्राम्थानकण, वैज्ञानिकता, शोधकर्ता, विद्यार्थी जगत आयोजन हेतु आयोजित है.

प्रशासनिक अधिकारी-३

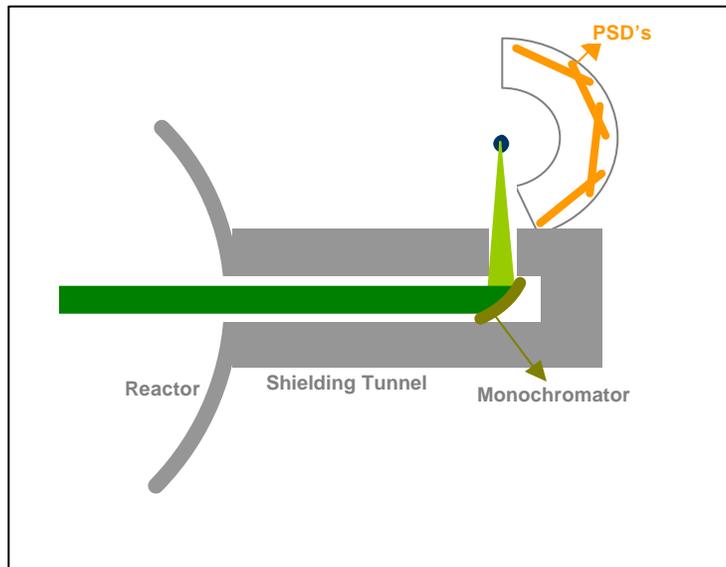
टिप्पणी :-

- विद्यार्थी, शैली विज्ञान / रसायनशास्त्र / इलेक्ट्रॉनिक विज्ञान, शैली अखिल विद्यार्थीसंघ द्वारा.
- विद्यार्थी, शैली विज्ञान / रसायनशास्त्र / इलेक्ट्रॉनिक विज्ञान, शैली विज्ञान संघ, इन्दौर.
- विद्यार्थी, शैली विज्ञान / रसायनशास्त्र / इलेक्ट्रॉनिक विज्ञान, शैली विज्ञान संघ, इन्दौर.
- इस संस्था की अग्रत वैज्ञानिक व शैली.

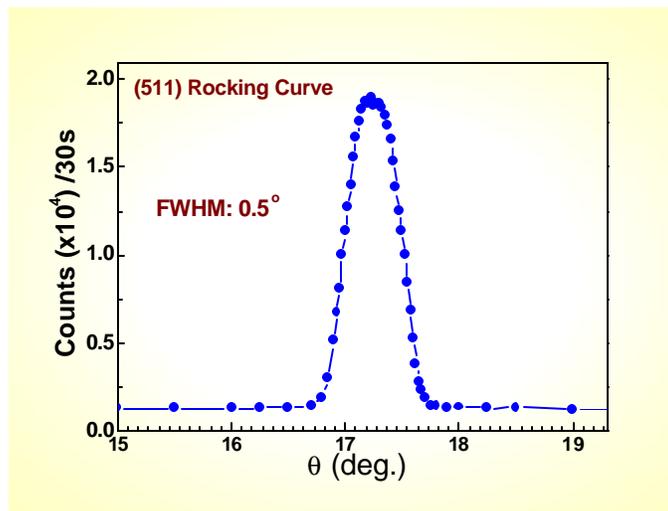
Indore Centre of the CSR has celebrated the Hindi Day by organizing scientific seminars in Hindi on September 21, 2007. Drs. R. V. Nandedkar (RRCAT, Indore) and V. G. Sathe (CSR, Indore) delivered scientific seminars in Hindi on this occasion

Focusing Crystal Based Neutron Powder Diffractometer at Dhruva Reactor, BARC, Mumbai

This recently installed Focusing Crystal Based Diffractometer (FCD) is designed to enable higher flux at sample position and also use of small samples. It is expected to be widely used in the area of chemical and magnetic structures of novel materials



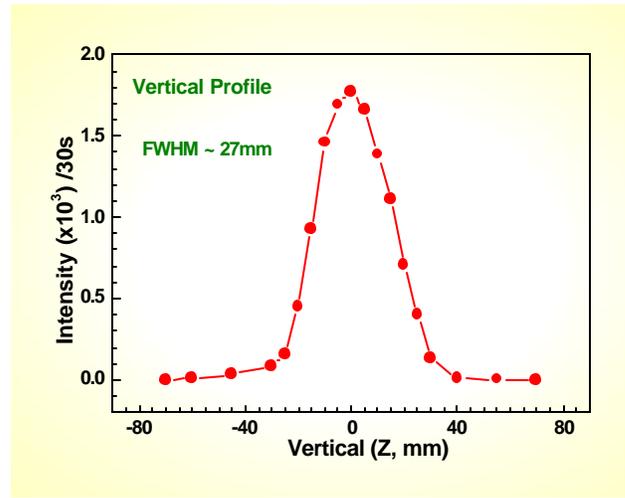
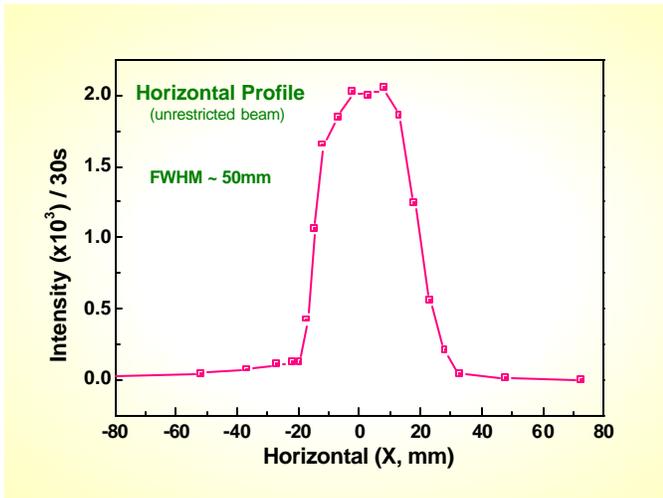
FCD, developed and installed by UGC-DAE Consortium for Scientific Research, is a multi-PSD high throughput diffractometer. It employs a bent perfect crystal monochromator at a take-off angle of 90 degrees and it is designed for a highly focused neutron beam of about 15 x 25 mm² in size. This would enable higher flux at sample position and also use of small samples (~ 1 cc in volume). The complete diffraction pattern obtained over four overlapping banks of three linear PSDs each, covers an angular range up to 123 degrees. The resolutions obtained are up to $\Delta d/d \sim 0.3\%$.



The monochromator can be rotated or flipped to give a range of wavelengths from 1.1 Å to 2.3 Å. The sample

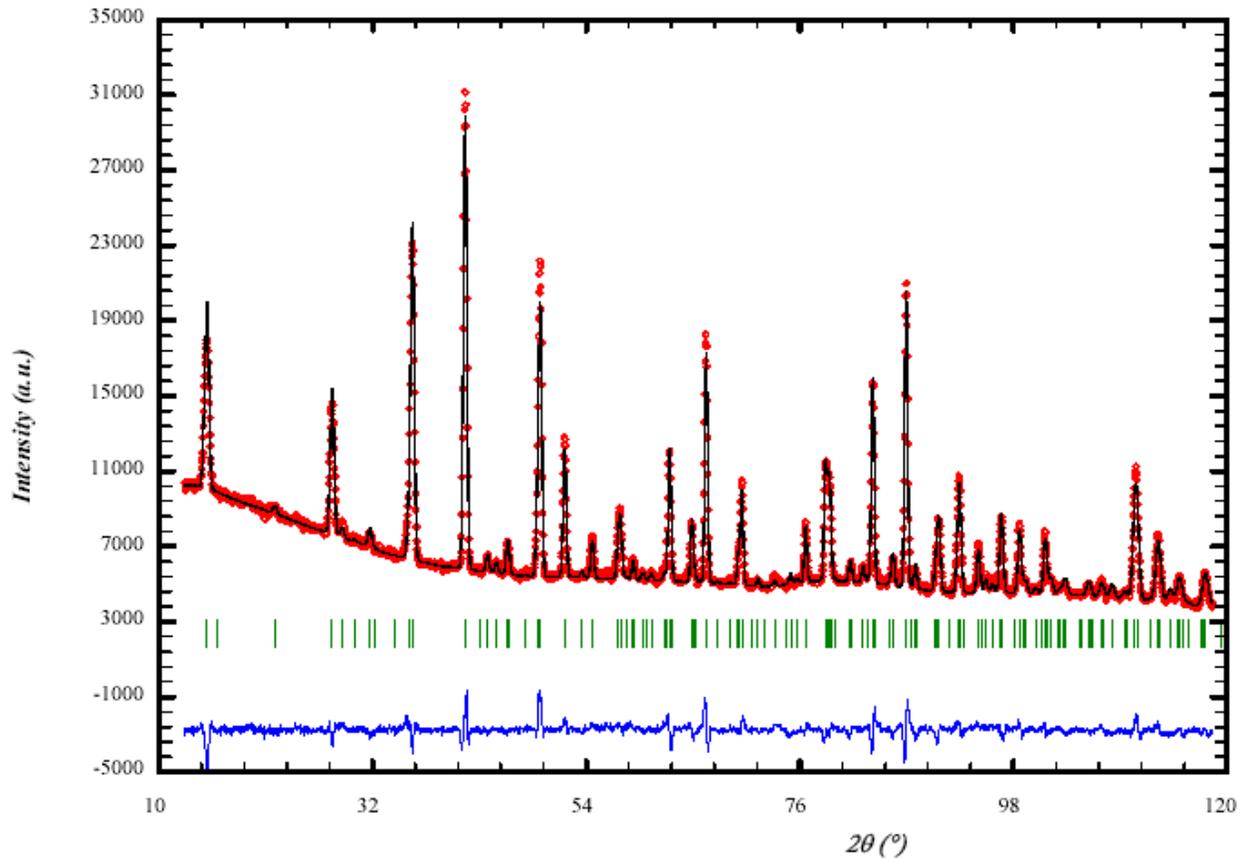
environment consists of a 4K CCR for standard measurements as a function of temperature and a cryogen-free 7 Tesla magnet with VTI for in-field measurements down to 1.4 K. An oscillating radial collimator (under installation) will be used to suppress extraneous contributions from the magnet and CCR shrouds. The data acquisition system, developed locally, has an input for up to 16 PSDs and the software enables recording various sequences of measurements with respect to incident neutron flux and sample temperature.

Beam hole no.	TT-1015
Monochromator	Bent Si
Wavelength	1.48Å (standard)
Beam size	15x25 mm ²
Flux at sample	7x10 ⁷ n.cm ⁻² s ⁻¹
Scattering angle	6° – 123°
Q range	0.4-7.4 Å ⁻¹ (1.48Å)
$\Delta d/d$	~0.3%
Detector	12 Linear 3He PSDs



Horizontal and Vertical beam profiles at the sample position at $\lambda=1.48\text{\AA}$

YMnO₃ Room Temperature Data



Neutron diffraction pattern of YMnO₃ taken at room temperature. Sample was provided by Dr. S. Patnaik, JNU, New Delhi

For further information please contact Administrative Officer, UGC-DAE CSR, University Campus, Khandwa Road, Indore – 452 017