

Year 2013
Issue 5
December

The Fourth State

Newsletter of the Institute For Plasma Research, Gandhinagar, Gujarat (India)

From the editorial desk

The editorial committee of the IPR newsletter wishes to thank all the IPR staff members for their encouragement and support that they have given to the revived newsletter. We hope that this will continue for all the forthcoming issues of "The Fourth State". Please feel free to send any comment / suggestion / feedback to the committee at <newsletter@ipr.res.in> for improvement of the look and contents of the newsletter. Thank you..

Plasma-2013

The 28th National Symposium on Plasma Science & Technology (Plasma 2013) was held at KIIT University, Bhubaneswar, Odisha, from 3-6 December 2013. More than 100 participants from IPR attended the conference and presented their research work as invited, oral as well as poster presentations. Professor Bimla Buti inaugurated the conference and the key-note address on "Fusion Science & Technology" was given by Prof Y. C. Saxena. The vote of thanks was delivered by the Convener, Dr. S. K. S. Parashar. There were 28 invited talks, 15 oral, and over 300 poster presentations at the conference.



Plasma 2013 - Inaugural function : Releasing the Book of Abstracts



There were 12 invited talks given by participants from IPR in the areas of Basic Plasma, Nuclear Fusion, Industrial Plasma, Exotic Plasma, Pulsed Power, Plasma Diagnostics, Laser Plasma and Computer Simulations in Plasma. There were a total of 398 abstracts which were accepted for presentation, of which, more than 150 were from IPR. The next edition of the conference will be held at the Mahatma Gandhi University, Kottayam, Kerala.

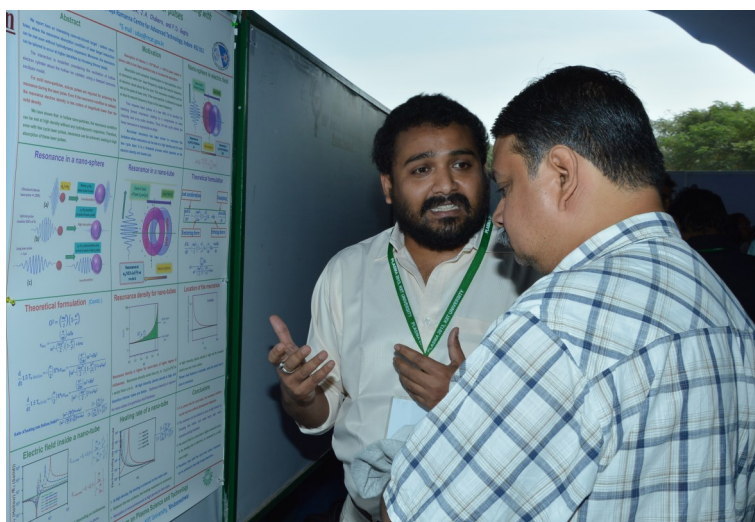


Of the 22 awards that were presented to the authors of the best posters in various categories, participants from IPR won **9 awards**. The winners were awarded a cash prize of Rs.5000/- and a certificate of merit by the Plasma Science Society of India (PSSI). The following participants from IPR were the winners of the poster awards.

Rakesh Tanna	Disruption Characterization And Database Generation For Itpa Disruption Database From Aditya Tokamak Discharges
Nitin Bairangi	Application Of Multi Layer Insulation (MLI) On SST-1 Cryogenic Surfaces
Ritesh Sugandhi	Development Of EPICS Based Software Toolkit For Critical Heat Flux Computations For Divertor Mockups Testing At High Heat Flux Test Facility
Rohit Agarwal	High Voltage Direct Current Water Load Bank
Roopendra Singh Rajawat	Study Of Linear And Nonlinear Evolution Of Buneman Instability
Akansha Gupta	Stability And Nonlinear Studies Of Shear Flow In Strongly Coupled Fluids
Chandrashekar Shukla	Guiding Of Relativistic Electron Beams Through Structured Plasma
Nilam Ramaiya	A PMT Array Based Diagnostics To Measure Spatial And Temporal Behavior Of $H-\alpha$ emission from Aditya tokamak
Kanchan Mahavar	Experimental Study Of Thermal Characteristic Of Different Thin Metal Foils For Infrared Imaging Video Bolometer And Comparison With FEM Simulations.



Prof. Buti inaugurating the exhibition and poster session



Animated discussions during the poster session



Prof. Y. C. Saxena lighting the bonfire at the KIIT Founder's dinner



Dr. S. Mukherjee giving away the PSSl awards at the concluding session

Parvez Guzdar Young Scientist Award - 2013



Dr. Prateek Sharma

The Parvez Guzdar Young Scientist Award for the year 2013 was awarded to Dr. Prateek Sharma, Department of Physics, IISc, Bangalore, in recognition of his work in the area of Space & Astrophysical Plasma.

Dr. Sharma completed his PhD in astrophysical sciences from Princeton University, USA, after which he was a post-doctoral fellow at UC Berkeley. He is an engineering physics graduate from IIT Bombay.

The award was presented during a special session in the Plasma-2013 by a member of Dr. Guzdar's family, Shri. Bahadur Postwala.

The award ceremony was followed by a talk entitled "*Coronae & outflows-the sun & beyond*" by Dr. Sharma.



Dr. Sharma delivering his talk



Planar Magnetron based PVD

FCIPT has developed PVD based magnetron sputtering system which can do different type of metal (Cu, Al, Zn, Ti, Cr, Ag, Mo etc.) as well as compound (TiN, AlN, ZnO) coating. Magnetron geometries like circular, Rectangular, Cylindrical are developed for coating different type of substrates.



Cylindrical Magnetron based PVD

Salient features of the PA-PVD techniques are:

- ◆ PAPVD provides coatings that are very dense.
- ◆ Fewer macroscopic defects.
- ◆ Possesses very good adhesion to the substrates.
- ◆ Environmentally friendly technique.
- ◆ Ease of sputtering any metal, alloy or compound.
- ◆ Ability to coat heat sensitive substrates.

Drafting & Workshop Facilities at IPR

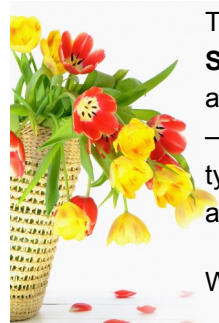
IPR Drafting Section

- Drafting section assists different groups of the institute to generate the necessary drawings for their requirements.
- These drawings include conceptual, engineering and fabrication type as well as built type.
- The section is equipped with trained manpower, necessary hardware and software to generate drawings in various platforms including AutoCAD, MDT, CATIA etc.
- The section has also worked on generating the drawings for Conceptual 3D model with fabrication drawings of Gyrotron, Negative Ion Extraction Chamber Assembly for CPP, 3D model of the Aditya structure, Magnet and Vacuum vessel for Aditya as per the drawings, Pb-Li Production system for TBM, Vessel design with new divertor coil for Aditya up gradation, Vacuum chamber for the Neutronics Lab etc.
- The drafting section has grown from drawing board to MDT and AutoCAD and on to Inventor and CATIA platforms.
- Number of staff members - 6

IPR Workshop

- IPR Workshop provides manufacturing and fabrication services as per user requirements from IPR, FCIPT, ITER-India and CPP, Guwahati (Negative Ion Extraction Chamber Assembly for CPP).
- Workshop has facilities for Turning, Milling, Drilling, Welding, Cutting etc.
- It has machine facilities like Lathe, Milling, Radial Drill, Plasma Cutting, Tig welding, Shearing etc.
- Workshop also keeps stock of raw materials required for fabrication needs.
- Typical jobs carried out at the workshop involve materials such as Graphite, Ceramic, Lead and Glass-fiber etc. which are usually not carried out by outside agencies.
- Number of staff members - 7

Adieu



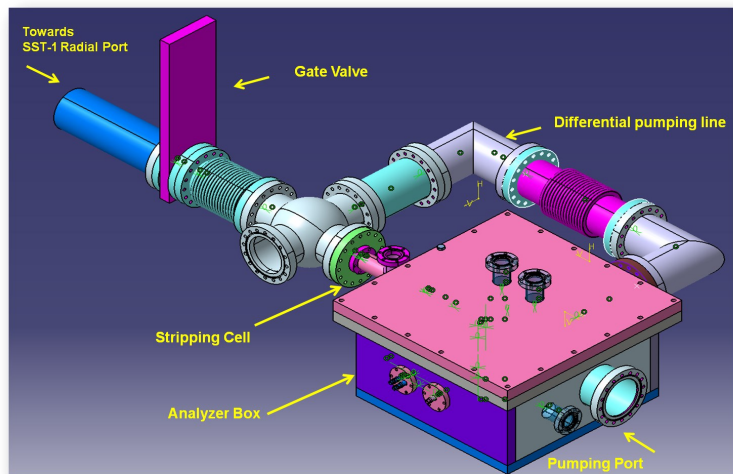
The Institute expresses its gratitude for the yeoman services rendered by **Shri. Shailesh B. Bhatt** to IPR. He began his association with IPR in April 1973, and after over 40 years of service, he superannuated on November 30, 2013 as Scientist – SG. He is acknowledged for his expertise in vacuum systems and for his ingenuity in trouble shooting vacuum related problems in various projects at PRL and later at IPR.

We wish him ALL THE BEST for all his future endeavours.

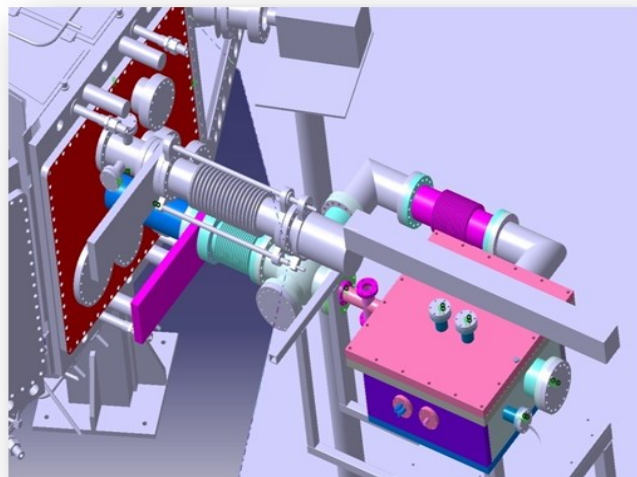


Don't simply retire *from* something; have something to retire *to*. ~ Harry Emerson Fosdick

- ◆ Charge Exchange Diagnostics is to be deployed at SST-1 for measuring the core ion temperature of the ohmic plasma.
- ◆ The diagnostics system is based on the Neutral Particle Analyzer [NPA] which uses the electrostatic parallel plate configuration to resolve the different energy components in the neutral beam (which is ionized using a gas cell prior to entering the analyzer plates) coming out of the confined plasma.
- ◆ The Diagnostics has been designed to measure the core ion temperature of plasma from 120 eV to 1 keV. The system is to be installed at the Radial port-15 of SST-1 machine.
- ◆ The assembly comprises of a drift tube connected with the SST-1 radial port using an isolation pneumatic gate valve and a DC break.
- ◆ A 35 CF cross chamber (stripping cell of 200 mm length) connects the drift tube to the Analyzer box (460 mm x 460 mm x 275 mm, outer dimensions) which consists of parallel plate assembly (a set of SS plates) where the electrostatic field is applied between the top and the bottom plate. This box is evacuated using a 1200 ltrs/sec TMP through the port available at the rear plate of the Analyzer box.



The CXD Layout with its components



The layout with SST-1 Radial port-15

Congratulations !

Dr. Mukti Ranjan Jana, Scientist at IPR, was awarded the "Employee Reward and Recognition - 2013" while working as a Post-Doctoral Fellow at the Fermi National Accelerator Laboratory, Illinois, USA. During his tenure at Fermilab, he was involved in the development Beam Diagnostic Instrumentation using Chromox-6 scintillation screen for measurement of 400 MeV proton beam intensity for the Fermilab MuCool Test Area (MTA).

Dr. M. R. Jana



The 30th DAE Safety and Occupational Health Professionals Meet will be held at the Uranium Corporation of India Limited (UCIL), Narwapahar, Jharkhand from 18th-20th December 2013. **Ms. Pratibha Gupta** (Engineer SE) will be awarded the 1st and 2nd Prizes in the Hindi and English slogan writing competitions respectively. **Ms. Hetal Verma**, Library Assistant, IPR, won the consolation prize for the cartoon competition in the same meeting.



Ms. Pratibha Gupta

The 1st prize winning slogan (Hindi)

श्वसन सुरक्षा संयंत्र को करें धारण,
गतिविधि हो जब मिलिंग या खनन।
दूर रहे जिससे श्वसन की बिमारियाँ,
स्वस्थ रहकर निभाएँ जीवन की जिम्मेदारियाँ॥

प्रतिभा गुप्ता



Ms. Hetal Verma



The consolation prize winning cartoon

Welcome !



Dr. (Mrs.) Ritu Dey
as Scientist (DST – Project) from October 11, 2013



Dr. Raj Singh
joined IPR as PDF from Nov 08, 2013



Dr. Ashwin Joy joined IPR under INSPIRE Programme (DST – Project) from November 08, 2013



Mr. J.D. Patel, has been associated with IPR since 1984. Presently he is the Senior PS to the ITER-India Project Director and Director, IPR.



Mr. Kaushik Acharya, has been associated with IPR since 1982. He is presently working with Aditya Tokamak group.



Mr. Madan B Kalal, has been associated with IPR since 1984. He is presently working with Aditya Tokamak group.

IPR Cricket Tournament

The much awaited cricket mania has begun in IPR with immense enthusiasm. More than 150 IPR employees have participated in the 2nd Inter-IPR Tennis Ball Cricket Tournament. The game was inaugurated on 16th November, 2013 by ACAO P.K. Atrey and Subrata Pradhan at J.C. Cricket ground near Chandkheda, Ahmedabad. This time Staff club has added colors to this passionate cricket series by providing dress codes for players: Group A teams in cool grey and Group B teams dressed in vibrant red.

The inaugural match was played between defending champions ITER-India Fighters and Team Scholars. 13 matches have been played so far with all the matches scheduled on weekends. *I-Design, Print-Vision, Aditya high vacuum & Growcontrols* have been sponsors for the success of the tournament.



SMASHERS are upbeat after their two consecutive victories !!!



ADMIN TIGERS in inaugural session



CRYO-11 during the inaugural session



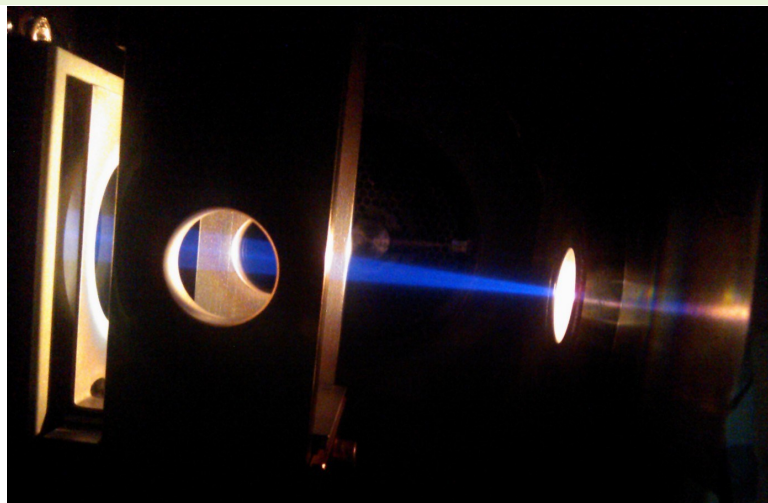
STRIKERS during their practice session

Group-A	Group-B
ITER-India Fighters	Admin Tigers
Team Scholars	Aditya XI
Strikers	Cryo 11
Smashers	FCIPT
ITER-India Lions	NBI Powerful Warriors
-	Motera Indians

- ♦ **High Heat Flux Test Facility (HHFTF)** has been recently installed, commissioned and tested successfully at Institute for Plasma Research, Bhat, Gandhinagar for its maximum output power of 200 kW.
- ♦ The HHFTF is useful to simulate steady state as well as transient heat loads conditions for testing thermal behavior of Plasma Facing Component's (PFC's), studying thermal performance of joints between plasma facing material and heat sink material having dimensions of the order of few centimeters to meter.
- ♦ This HHFTF consist of 200 kW High power electron beams system which is used as a heat source for simulating high heat load conditions during thermal load tests of PFC's.
- ♦ High Power Electron Beam System is highly sophisticated with the State-of-Art and is capable for precise heat deposition on defined surface of PFC test mock-up with typical power from 10 kW to 200 kW with electron beam operation time from 1 ms to Continuous.



Electron Beam Gun mounted on the test vacuum chamber



Electron Beam as seen through gun view-port

Following are **operating specification of HHFTF**:

Electron Beam System Parameters:

Electron Beam Power : 0 to 200 kW
 Acceleration Voltage : 0 to 45 kV
 Beam Current : 4.45 A max.
 Beam Diameter : 10 to ~20 mm
 Deflection Angle : Hor : $\pm 25^\circ$ Ver : $\pm 25^\circ$
 Rastering Frequency : 0 Hz to 10 kHz
 Operation : Pulsed & Continuous

Diagnostic Systems:

Infrared Camera : Surface temperature profiles
 Single/Two Color Pyrometers : Point Surface temperatures
 Thermocouples : Bulk temperatures
 Residual Gas Analyzers : Partial pressure and detection of foreign species inside test chamber
 Coolant Calorimetry : Heat removal capability
 Monitoring System : Visual observations and records

Portable water coolant system:

Flow : 100 LPM (at 20 bar)
 Temperature : $25^\circ\text{C} - 80^\circ\text{C}$
 Pressure : 5 bar – 20 bar

Vacuum Chamber parameters

Vacuum chamber : D-shaped double walled vertical
 Inside Vacuum : 10^{-3} mbar to 10^{-6} mbar
 Test Mock-ups : Tungsten, CFC blocks
 Inside Volume : $\sim 5.2 \text{ m}^3$
 Overall Thickness of chamber : $\sim 30 \text{ mm}$
 Pumping System : TMP, Cryo Pumps

For further info go to this link: <http://goo.gl/GfuwQ9>

InPAC - 2013

The 6th BRNS-Indian Particle Accelerator Conference (InPAC-2013) was held at VECC Kolkata from 19th to 23rd November 2013 and was represented by an IPR delegation. Mr. Mohandas K.K (Accelerator Division) and Mr. Sanjeev Kumar Sharma (NBI division) gave oral presentations. Six posters from IPR were also presented. This biennial conference was jointly conducted by the Indian Society for Particle Accelerators (ISPA) and VECC.

ISAMP-TC 2013

A topical conference was jointly organized by IPR and ISAMP, with a theme of "Atomic Processes in Plasmas", during Nov 18-20, 2013. 95 Scientists, Research scholars, PhDs and students working all over the country participated, including 12 from IPR. The keynote address was delivered by Prof. Vijay Kumar while conference was inaugurated by Prof Abhijit Sen.



Participants of ISAMP-TC-2013

The Monaco ITER International Fusion Energy Days (MIIFED) organised from Dec 2-4, 2013 was a platform to highlight the partnership established between the ITER Organization and the Principality of Monaco in January 2008. Delegates of the ITER Organization, ITER Domestic Agencies, international fusion labs and industries gathered in Monaco at the invitation of His Serene Highness Prince Albert II to share their experience and knowledge working within and along with the ITER Project. It also marked the status of the ITER Project and ITER-related research worldwide.

IPR representatives Prof Dhiraj Bora (Director, IPR) gave a presentation on “*Education and awareness activities about Fusion in India*”, Dr. R. Srinivasan delivered a talk on “*Indian Plan for DEMO*”, Mr. Dilshad Sulaiman of ITER-India gave a talk on “*Progress in ITER In-wall Shielding Manufacturing*”, and Shri. P.K. Atrey presented poster highlighting the R&D and outreach initiatives of the Board of Research in Fusion Science & Technology (BRFST) in India.



Prof. O. Motojima, DG, ITER, giving the welcome speech



Prof. Bora with IPR / ITER-India representatives at MIIFED

ACNM & NEEM

School on “**Advanced Characterization methods for Nanophase Materials (ACNM)**” was held on 22,23 November 2013 at Hotel Gateway Hotel Ummed, Ahmedabad. The Keynote address was given by Dr. Augusto Marcelli (INFN – LNF and Co-Chairperson of the Scientific Programme committee of both ANCM & NEEM) and Dr. S. Mukherjee.

There were 14 lectures delivered by 12 speakers from India (RRCAT, SINP, IUAC), Italy, France, Japan and USA.

The topics covered were XRD, XAFS, XANES, Raman spectroscopy, Photoemission spectroscopy, Optical spectroscopy, Muon spin resonance etc.



Inauguration of NEEM-2013

The Workshop was followed by **School on Nanoscale Excitations in Emergent Materials (NEEM)** from 25-26 November 2013.

The Programme Chief Guest, Ambassador of Italy to India, His Excellency Daniele Mancini, inaugurated the function while Prof. Abhijit Sen delivered the Welcome address. There were a total of 15 speakers from both India and Italy.

Prof. Lidia Szpyrkowicz, the Scientific Counsellor in the Italian embassy gave a talk on “*Indo – Italian educational and research collaboration possibilities*”, while Shri Rajiv Kumar, affiliated to the Bilateral Cooperation Division of DST, gave an overall view of India's re-

search collaboration with Europe and other countries. Best poster awards were also presented to Ms. Jethva Sadaf Alibhai from Saurashtra University and Mr. Shammi Verma from IUAC, New Delhi.



Participants of ACNM-2013

- ◆ Gravitational Wave Physics and Astronomy Workshop (GWPAW), 17- 20 December 2013, Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India. <http://www.iucaa.ernet.in/~gwpaw/>
- ◆ Winter Conference on Plasma Spectrochemistry, 6 - 11 Jan 2014, Amelia Island, Florida USA. http://icpinformation.org/2010_Winter_Conference.html
- ◆ 9th EU-Japan Joint Symposium on Plasma Processing (JSPP2014) and EU COST MP1101 Workshop on Atmospheric Plasma Processes and Sources, 19 - 23 January 2014, Bohinjka Bistrica, Slovenia. <http://plazma.ijs.si/jspp2014/JSPP2014.htm>
- ◆ First Costa Rican Summer School on Plasma Physics, 20 - 24 January 2014, San Carlos, Alajuela, Costa Rica. <http://lawpp2014.org/school-of-plasma/>
- ◆ Twenty-First IAEA Technical Meeting on Research Using Small Fusion Devices (RUSFD), 27 - 29 January 2014, San Jose, Costa Rica. <http://lawpp2014.org/rusfd/>
- ◆ Fifteenth Latin American Workshop on Plasma Physics (LAWPP 2014), 27 - 31 January 2014, San Jose, Costa Rica. <http://lawpp2014.org/lawpp/>
- ◆ Second Latin American Workshop on Industrial Applications of Plasma Technology (AITP), 30 - 31 January 2014, San Jose, Costa Rica. <http://lawpp2014.org/iapt/>
- ◆ National Symposium on Emerging Plasma Techniques for Materials Processing and Industrial Applications (N-SEPML 2014), During 13-15 Feb. 2014, at Department of Physics, University of Pune, Pune.

Past Events @ IPR

- ◆ **Prof. B. N. Goswami**, Director, Indian Institute of Tropical Meteorology, Pune, gave a talk on “*Scaling the Potential Predictability Barrier of the Indian Summer Monsoon Rainfall: An Indian Initiative*” (Colloquium #227) on 11th November 2013
- ◆ **Dr. Arvind Kumar Saxena**, Physical Research Laboratory, Ahmedabad, gave a talk on “*Study of Cluster Ions by Mass Spectrometry and Optical Spectroscopy*” on 28th November 2013

From The Archives of IPR



IPR in early 90's. How many current staff members can you identify in this photograph ?

Mohandas K. K.
Shravan Kumar
Swati Roy

The Team

Chhaya Chavda
Ramasubramanian N.
Ravi A. V. Kumar

Hiral B. Joshi
Prabhat Kumar
Priyanka Patel

Institute for Plasma Research
Bhat, Near Indira Bridge
Gandhinagar 382 428,
Gujarat (India)



प्लाज्मा अनुसंधान संस्थान
Institute for Plasma Research

Web : www.ipr.res.in
E-mail : newsletter@ipr.res.in
Tel : 91-79-2396 2000
Fax : 91-79-2396 2277