

DAE participated in the prestigious Parade Ceremony at Rajpath, New Delhi on the 66th Republic Day 2015. The display was a tableau on the theme imbibed in the motto of the Department - "Atoms in the Service of the Nation".

The tableau showcased the achievements and services of the Department in the areas of Healthcare Management and Food & Agriculture and presented the Nuclear Power as a clean and environment-friendly energy option for Peace, Power.

In the Diamond Jubilee year of the Department Of Atomic Energy, the tableau also paid a somber homage to the founding father of DAE, Dr. Homi Jehangir Bhabha, on a distinguished and highly prominent platform for public outreach.



Celebrating the spirit of Diamond Jubilee year : The Department of Atomic Energy Tableau in the 66th Republic Day Parade at New Delhi

Possibility of Utilization of Plasma Pyrolysis Technology at GIFT City Gandhinagar

In order to explore the possibility of utilization of Plasma Pyrolysis Technology for the disposal of waste generated at GIFT (Gujarat International Finance Tech) city, Gandhinagar, using an environmental friendly technology, Prof. Dhiraj Bora, Director IPR visited GIFT City on 31st December 2014 and discussed with Shri. Ramakant Jha, Managing Director GIFT city Gandhinagar, the various aspects of utilizing this technology.



Shri. Ramakant Jha, Managing Director GIFT City Gandhinagar explaining the major highlights of GIFT city to Prof. D. Bora.

Spacecraft Plasma Interaction eXperiment (SPIX-II)

For the study of electrostatic discharges phenomena on the surface of satellite solar panels, FCIPT has developed an experimental test facility for LEO and GEO like space environments. This facility [SPIX-II] has been successfully commissioned and currently in operation at FCIPT since last 18 months. The experimental results on the satellite solar panel are found encouraging and meet international standards mentioned in the ISO-11221 document. There are similar type of facilities exists at NASA, European space agency, Japanese space agency and China.



(L-R) Prof. Bora along with SPIX-II project team handing over the set of experimental result reports to Mr. R. Ekkundi, Deputy Director, ISAC, ISRO Bengaluru on 11th November 2014 at IPR. The SPIX-II experimental setup at FCIPT.

Upcoming Events @ IPR

- 42nd IOP Plasma Physics Group Conference, Kents Hill Park, Milton Keynes, MK7 6BZ, United Kingdom, 30 March 2 April 2015 http://physicsworld.com/cws/event/2015/mar/30/42nd-iop-plasma-physics-group-conference
- Complex Systems of Charged Particles and their Interaction with Electromagnetic Radiation, Moscow, Russia, 8-10 April 2015 http://www.gpi.ru/workshop/first_call_2015.pdf
- 7th International Conference on the Frontiers of Plasma Physics and Technology (FPPT-7), Kochi, India, 13-17 April 2015 http://www.fppt-series.com/
- 1st EPS Conference on Plasma Diagnostics, Frascati, Italy, 14-17 April 2015 http://www.ecpd2015.enea.it/
- Fusion Academy Course on Fusion Science and Technology, Heeze, Netherlands, 15-17 April 2015 http:// www.fusionacademy.eu/
- 10th IAEA Technical Meeting on Control, Data Acquisition, and Remote Participation for Fusion Research, IPR, Gandhinagar, 20-24 April 2015 http://www.ipr.res.in/iaeatm2015/
- Novel Light Sources from Laser-Plasma Interactions, Dresden, Germany, 20-24 April 2015 http://www.mpipksdresden.mpg.de/~nlight15/
- 21st Topical Conference on Radiofrequency Power in Plasmas, Lake Arrowhead, California, USA, 27-29 April 2015 https://conferences.pa.ucla.edu/rfppc2015/index.html

IPR *ⓐ* Conferences

पराग रसिकलाल पंचाल, रहेवासी. अहमदाबाद, वह फिलहाल ईंन्सीटीयुट फोर प्लाजमा रीसर्च मे कार्य करते है ! पराग विकलागता क्षेत्र पीछले 13 सालो से सक्रिय कार्यो कर रहे है ! नवम्बर, 2014 मे पुरे भारत देश की और से **बाधारहीत** वातावरण (Barrier free built environment) पर पेपर प्रस्तुत करने के लीए जर्मनी सरकार की जी.आई.जेड. संस्थाने पराग को आंतर राष्ट्रीय कोन्फरंस "प्रेकटीस फोरम एकसेसिबिलिटी" बोन शहर, जर्मनी मे आमंत्रीत कीया था ! वहा पर परागने बाधारहीत वातावरण का निर्माण करने की जरुरीयात क्यु है ! बाधारहीत वातावरण कैसे कीया जाता है ! क्या - क्या चरण ध्यान मे रखने पडते है ! कौनसी चुनोतीया आती है ! और अन्य और देशो मे वाधारहीत वातावरण करने के लीए क्या करना चाहीए ! राष्ट्रीय एवं आंतर राष्ट्रीय नितियो पर कैसे



कार्य कीया जाए और क्या बदलाव लाया जाए जैसी बाते पराग ने अपने पेपर प्रस्तुती मे रजुआते की थी ! ईस आंतर राष्ट्रीय कोन्फरंस मे भारत की और से पराग और अन्य देशो जैसे की अमेरिका, साउथ अमेरिका, फ्रांस, साउथ आफ्रिफा, चिली, ओस्ट्रीया, वेस्टीडीज, बांग्लादेश, ईग्लेड जर्मनी, ईंडोनेशिया, सेनेडीआज, केनेडा देशो के प्रतिनिधिओ एवं युनाईटेड नेशन के सेक्रेटरी ने हिस्सा लिया था ! पराग पंचाल को वर्ष 2008 मे गुजरात सरकार के श्रम एवं रोजगार मंत्रालय के अग्र सचिव श्री आर. एम. पटेल ने विकलाग श्रेष्ठ कर्मचारी का एवोई प्रदान कीया गया था !

विश्व हिन्दी दिवस 2015

संस्थान में 12 जनवरी, 2015 को सेमिनार हॉल में विश्व हिन्दी दिवस का आयोजन किया गया है। इस कार्यक्रम में हिन्दी में दो वैज्ञानिक व्याख्यान रखे गये। डॉ.तेजेन कुमार बसु ने 'अतिसूक्ष्म प्रौद्योगिकी' विषय पर एवं डॉ. सुब्रत प्रधान ने 'स्थिर अवस्था अतिचालक टोकामक:एसएसटी-1' विषय पर व्याख्यान दिया। ये दोनों विषय वक्ताओं द्वारा पावर पॉइंट के माध्यम से विस्तार पूर्वक प्रस्तुत किये गये। डॉ.तेजेन कुमार बसु ने नैनो टेक्नॉलोजी की परिकल्पना को विभिन्न चित्रों एवं विडियो के माध्यम से आकर्षक रूप से सरलता से समझाया। डॉ. सुब्रत प्रधान ने संस्थान के एसएसटी-1 टोकामक के निर्माण काल अवस्था से अब तक की प्रगति एवं इसके निर्माण एवं संयोजन में लगे परिश्रम की विस्तार पूर्वक जानकारी दी । उन्होंने एसएसटी-1 की भविष्य की योजनाओं पर भी प्रकाश डाला। कार्यक्रम के अंतिम चरण में वैज्ञानिक हिन्दी प्रश्नोत्तरी प्रतियोगिता का भी आयोजन किया गया जिसमें सदस्यों ने उत्साहपूर्वक भाग लिया। विश्व हिन्दी दिवस समारोह के अवसर पर पुस्तकालय अनुभाग द्वारा सेमिनार हॉल के बाहर विभिन्न विषयों से संबंधित हिन्दी पुस्तकों की प्रदर्शनी का भी आयोजन किया गया।



Hands-On School on Nonlinear Dynamics



A week long school on Nonlinear Dynamics was organized by IPR from 16-21 February 2015 at IPR. This hands-on school provided the participants with an interactive experience with table-top experiments in various areas of nonlinear dynamics such as coupled plasma devices, nonlinear electronic circuits, opto-electronic systems, chemical oscillators, biological networks, etc. The objective of the school is to expose young researchers and faculty to various experimental fields of nonlinear dynamics in order to nucleate and promote experimental activity in this area in university departments and other research institutes in India. Participants also presented their own research work in a special poster session.



(L-R) Prof. A. Sen, Prof. Bora and Dr. Mukherjee addressing the participants. Prof Sen and Prof. Dana (IICB, Kolkata) during discussions





Silver Stars Of IPR

Dr. Amita Das, Senior Professor and Associate Dean (Staff Affairs), joined IPR in 1990. An alumna of IIT Kanpur with doctorate from there, she is a well-known plasma theorist with wide range of interests in the depiction of various plasma phenomena at fast (electron relevant) time scales to the slow dynamics involved in the ion and dusty plasma physics. She has worked extensively on laser plasma interaction studies, dynamical evolution of coherent structures, instabilities and turbulence associated with plasmas in the Magneto hydrodynamic (MHD), Electron Magneto hydrodynamic (EMHD) and visco-elastic fluid (pertinent for strongly coupled plasma medium) regimes. Honoured by the Outstanding Research Investigator Award in 2005, she also has been elected Fellow of Indian Academy of Sciences and the Gujarat Science Academy. She is the area chairman of the To-kamak Research & Fundamental Plasma Studies and heads the theory group on nonlinear physics and simulations and modelling activities for the basic plasma fusion theory. She is also a member of the management advisory committee (MAC) of the International ITER project.

Dr. Vinay Kumar, Project Manager (Diagnostics) at ITER India, joined IPR in 1990 post completing his PhD from I.I.T. Kanpur. An experimental physicist, he has set up spectroscopy diagnostics for tokomak plasma and has worked extensively on laser produced plasma, tokomak plasma and other discharges. He is a recipient of the BOYSCAST Fellowship (Govt. of India) and has consequently worked at the Joint European Torus (JET), UK. He was instrumental in instituting the formal internship program under National Fusion Programme (NFP). As a group leader, he has established the Planning, Monitoring and Support group at ITER-India. He has worked in Configuration Control Board (CCB) of the International ITER project as an IN-DA Configuration Manager. He is also a member of the IT-PA (International Tokamak Physics Activity) Diagnostics Topical Group.

IPR Staff Club Picnic to Jaisalmer

A 2-day picnic to Jaisalmer, Rajastan was organized by IPR Staff club on 21-22 February. The trip started with the buses carrying the 206 participants being flagged off from IPR campus at 9.40 pm on 21st and reaching Jaisalmer the next morning. A trip to the centuries old Sonar Kila (the Golden Fort) followed : Apart from a place for living and conducting business with an ancient royal flavour, the Jaisalmer fort also has a magnificent Jain temple and the exquisite *Patwa Ki Haveli*. Post lunch, the trip moved on to visit the *Kuldhara Village*, known as the haunted village , where only time ravaged remains of homes left behind by people some 160 years back can be seen now. This was followed by camel ride to the sunset point at the expansive sand dunes of Sam. There were Swiss tents for every family and bachelor groups to spend the night but before that, there were folk musicians and dancers performing exclusively for the IPR group, in which, many of the IPR group joined to dance to the tunes of popular beats of Bollywood. The forenoon of next day was reserved mainly for adventure sports and many IPR'ites tried their hands at parasailing and dessert safari. This was followed by a trip to *Bada Bagh* where the Maharaja of Jaisalmer managed to convert a patch of dessert land into beautiful garden of flowering and fruiting trees but the centre of attraction was the royal cenotaphs : a large garden complex of *Chhattris* of Maharajas of Jaisalmer state, starting with Jai Singh II of 1743. It was 2.30 am on 23rd when the last bus arrived back at IPR campus, thus concluding a very well organized picnic .



Pulsed Electrical Wire Explosion Experiment @ CPP

An experimental setup was recently installed at CPP-IPR for the production of metal powder using pulsed electrical exploding wire technique. The experimental setup mainly comprises of an evacuation chamber, a vacuum pump and a pulsed power system. Electrical grade copper wires were placed inside the chamber for explosion.

Experiments were carried out to explode electrical grade copper wires of length 40 mm and diameter 0.3 mm. The discharge was made inside a vacuum chamber at 50 mbar pressure by discharging a 10µF capacitor at 8000 V through a high voltage switch to the copper wire. The current produced during the discharge was measured using a current probe. The peak current was found to be 8000A. Due to Joule heating, the wire initially gets vaporized and then forms plasma and subsequently explodes. During the explosion, the metal plasma interacts with the background gas medium and condenses to form tiny particles. The tiny particles so formed were collected on glass substrates. The coated glass samples were analyzed with scanning electron microscope (SEM) for morphological changes. The work has been continuing for precise synthesis of metal powder and analysis.



(L-R)The photograph of the experimental setup. SEM micrograph showing formation of nano-sized copper particles.

SST-1 Update

Phase 1 of the assembly of Plasma Facing components (PFC) has been completed and the activities of the phase 2 has been already started. In order to validate the modified hydraulic scheme of PFC baking and temperature uniformity amongst the modules, all the modules have been tested in the modified vacuum chamber, which was earlier used for the testing of LN2 Shields. Headers of the baking system and newly fabricated PF-6 coil are being installed in the vacuum vessel. The hydrostatic test of 4 numbers of medium pressure and 2 numbers of high pressure helium gas storage tanks successfully completed by SST-1 cryogenics team. After rigorous cleanliness and dry hot nitrogen gas purging and evacuation procedures to achieve moisture contents within the vessels less than 5 ppm, these vessels will be put back into the services.



Images on the left from L-R: High pressure (HP) and medium pressure (MP) Helium gas storage tanks of SST-1 cryogenics system and pressure gauges showing the pressures of MP and HP tanks during the hydro test respectively

In order to achieve better gas puffing efficiency, it is planned to install Supersonic molecule beam injection (SMBI) system on SST-1 machine for the coming experimental campaigns. Experimental arrangement for the same has been fabricated and laboratory tests were conducted. Experiments conducted to see the effect of gas feed with Laval nozzle in dc discharge. Discharge current was also measured with different inlet pressure ranging from 1-7 bar (g) of hydrogen gas during this experiment. Fast imaging experiment was also conducted to see the divergence of beam in atmosphere.

Images on the right shows the image of the Laval nozzle, experiments conducted to see the effect of gas feed with Laval nozzle in dc discharge and images from the Fast imaging system to see the divergence of the beam in the atmosphere.



Part-II of Manufacturing Readiness Review for ITER Cryostat

The largest vessel of its kind to be i.e. ITER Cryostat underwent its second part of Manufacturing Readiness Review (MRR) at the site Larsen & Toubro (L&T) Heavy Engineering in Hazira, Gujarat on 30 January 2015. Further to first MRR for Base Section & Lower Cylinder components of this 30 metre tall and wide vessel held on April 16-17, 2013, this MRR meeting covered the remaining items viz. Upper Cylinder, Top Lid, Shielding blocks, Assembly Tooling, Transporter Frames, etc.

Chaired by S C Chetal (Ex-Director, IGCAR), the review panel consisted of representatives from ITER-India, L&T and ITER Organization. The panel reviewed the manufacturing readiness in terms of status of the design & manufacturing documents and also assessed the ongoing fabrication of Cryostat components (Base Section & Lower Cylinder) at the shop floor. L&T presented the status of the progress in fabrication which was appreciated by the panel. The panel members offered their valuable comments and suggestions which shall be followed by L&T during manufacturing. It is because of the intense collaborative efforts between ITER-India, L&T and ITER Organization that Cryostat has progressed well into manufacturing phase.

With successful completion of this MRR, the rest of the Cryostat is now ready to undergo fabrication. The Cryostat Workshop at ITER site in Cadarache, France now eagerly awaits for its first batch of Cryostat components, which will then undergo sub -assembly/welding before the main assembly begins in the Tokamak pit.



(L-R) The MRR meeting at L&T Hazira. Fabrication progress on one of the six 60 degree segments of Cryostat Base Section Tier-2.

ITER-India Achieves Successful Factory Acceptance Test of Diacrode Based System

For the Ion-Cyclotron RF Power Sources that are part of India's contribution to ITER project, ITER-India is pursuing R&D on two technologies viz. Diacrode and Tetrode based systems out of which the successful technology will be chosen for the main ITER deliverables. The Diacrode based system R&D is in progress under a contract with Thales Electron Devices, France. This February the Factory Acceptance Tests of Driver and Final Stage Tubes/Amplifiers were conducted successful ly at Thales site and satisfactory results were obtained, thereby ITER-India achieved an important milestone in the program. The test summary is as follows: Power tests of the global chain (HPA1+HPA2+HPA3) were conducted on matched load as-(HPA=High Power Amplifier). At 35MHz: 1.5MW for > 2000s and at 36MHz: 1.5MW for > 2000s

A run test was conducted successfully at 36MHz: 1.7MW for 3600s, At 45MHz: 1.5MW for 2000s, At 55MHz: 1.5MW for 2000s, At 65MHz: 1.5MW for 2000s

A burn test for 1.5MW/2000s at 65MHz with 25% duty cycle (5 consecutive pulses) was conducted successfully.

Other parameters for each operational frequency

Gain of the Diacrode	~ 13.2 - 14.6dB
Anode efficiency	~ 61 % to 63.9%
Max. o/p harmonics level	< - 20 dBc
Bandwidth at -1dB point	> 2 MHz

ITER-India and Thales Electron Devices team during the Factory Acceptance Test



- Dr. H. Tuong, CEA, Cadarache, France, gave a talk on "Progress of WEST" on 10th February 2015
- Dr. Jayashree Ray, Cryomagnetism Laboratory, Department of Physics and Astronomy, National Institute of Technology, Rourkela, Odisha, gave a talk on "Investigation Study of Magneto-electric Coupling in Multi-ferroic Bismuth Alloys" on 10th February 2015
- Dr. Ashwin Joy, Institute for Plasma Research, Gandhinagar, gave a talk on "*Microscopic Origin of Shear Relax-ation in a Model Viscoelastic Liquid*" on 11th February 2015
- Dr. Santanu Banerjee, Institute for Plasma Research, Gandhinagar, gave a talk on "Edge Turbulence and Convective Intermittent Transport (blobs) in Tokamaks - An Experimental Perspective" on 11th February 2015
- Dr. Ujjwal Sinha, Instituto Superior Tecnico, Portugal, gave a talk on "Polarization Spectra from PIC Simulations of Collisionless Shocks" on 16th February 2015
- Hands-on School on Nonlinear Dynamics, IPR, Gandhinagar, 16-22 February 2015
- Prof. Parthasarathi Majumdar, Ramakrishna Mission Vivekananda University, Belur, gave a talk on "The Quantum and the Continuum: Einstein's Dichotomous Legacies" on 18th February 2015 (Colloquium # 246)
- Prof. Kunioki Mima, Graduate School for the Creation of New Photonics Industries and Institute of Fusion Nuclear, Universidad Politecnica de Madrid, gave a talk on "Laser Plasma Physics with GEKKO XII-LFEX at Osaka University" on 24th February 2015 (Colloquium # 247)
- ◆ **Dr. Subhanarayan Sahoo,** Trident Academy of Technology, Bhubaneswar, Odisha, gave a talk on "*Frequency* and *Time Domain Behaviour of Modified CaTiO*₃ Nanoceramics for Thermistor Application" on 25th February 2015
- Dr. Bidyut Das, CPP-IPR, Guwahati, gave a talk on "Plasma Transport across Transverse Magnetic Filter Field in a Double Plasma Device" on 25th February 2015



From the IPR Archives



1986 : Construction work of the IPR campus was in full swing.

IPR faculty inspecting the construction of the Aditya pit.

Some of the persons in the image are, (L-R) Prof. Y C Saxena, prof P K Kaw, Prof. P I John and Prof Abhijit Sen (facing the camera).

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