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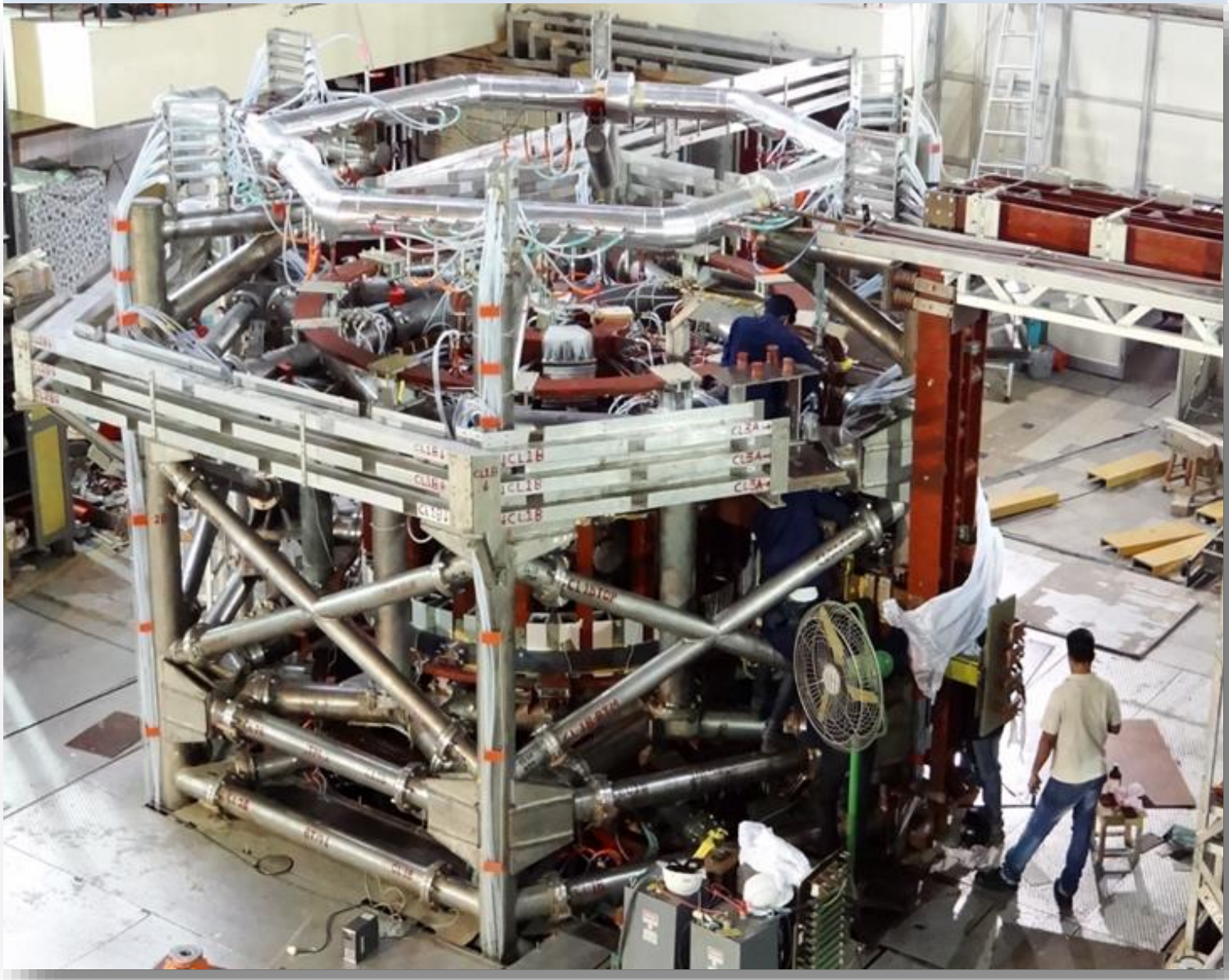
The Fourth State

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

Aditya Upgrade News

The assembly of Aditya Upgrade tokamak is successfully completed. The Re-assembly activities involved, installation of new circular shaped vacuum vessel, new buckling cylinder, TF coils (20 nos.), TR coils (11 nos.), BV coils (4 nos.), FFB coils (4 nos.), Diverter coils inner (02 nos.), Divertor coils outer (02 nos.) and auxiliary Diverter coils (02 nos.). The bus-bar connections of all the coils (new and old) are assembled and clamped with proper supports. The coils are accurately positioned within an accuracy of +/- 2 mm using ECDS. The TF, TR and BV coils cooling connection installation work is completed. All 20 nos. of TF coils, TR and BV coils cooling connections are tested with D.M. water at 1.5 kg /cm^2 inlet pressure.

The TF, TR and BV coils were successfully charged during integrated power testing. The TF coil assembly has been tested ~ 1.5 Tesla, The Ohmic coil assembly has been tested ~ 12.5 kA (Loop Voltage ~ 20 V), The Vertical coil assembly has been tested at ~ 3 kA. The displacement of the TF coils, fault current monitoring and magnetic field measurements was carried out during current charging. The movement of outer vertical leg of TF coils was recorded below 0.2 mm at full TF current. There was no fault current observed during the test.



The Aditya machine upgrade under progress

2nd PFRC-BRNS Meeting

The 2nd meeting of the Plasma & Fusion Research Committee (PFRC) of DAE-BRNS was convened at the BITS Pilani Goa campus from 12-13 May 2016. The Director of BITS Goa, Prof. Sasikumar Punnekkat welcomed the committee members and the Chairman of the PFRC committee, Prof. P. I. John set the review meeting in motion.

Thirty new projects with a net value of ~ Rs. 7.60 Crores were reviewed by the committee during the course of the two day meeting attended by the Project Investigators from universities and institutions from all over India and the Project coordinators from IPR. The meeting was coordinated by the PFRC Member Secretary, Dr. Ravi A V Kumar.

The Director of BITS Goa welcoming the PFRC committee and the participants of the 2nd PFRC-BRNS meeting

The 2nd PFRC-BRNS meeting in progress

One-Day Workshop on Thermal Plasma and its Industrial Applications

A one day workshop on Thermal Plasma and its Industrial Applications was organized by FCIPT on 29th April 2016. The aim of this workshop was to sensitize industries about how thermal plasmas can be used for industries in the field of waste management, nano-material production, ceramic/mineral processing etc. The workshop was attended by around 50 participants from various industries. Participants were excited to see Plasma Pyrolysis, Nano-Powder Production and Plasma Torch during laboratory visit.

Participants of the 1-day workshop on thermal plasma and its industrial applications

GTU-IPR Start-Up Workshop

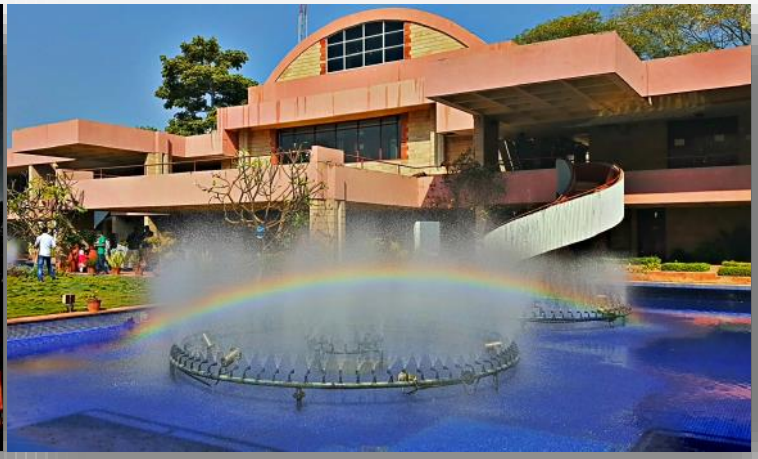
A Seminar on Plasma Technology was arranged by Gujarat Technological University (GTU) on March 5, 2016 at GTU in association with Institute of Plasma Research, Gandhinagar to create awareness of plasma high tech applications to faculty and students. GTU being Gujarat's largest university with 5 lac students and 17, 500 faculty spread over 500 affiliated colleges in the State of Gujarat, response was tremendous. Seeing the phenomenal response, it was decided to hold a two-day training workshop jointly by GTU and IPR. Consequently, the start-up workshop with plasma case study was organized to introduce plasma project opportunities along with practical demo at FCIPT at Gandhinagar.

Response of GTU and other local university graduate engineering/technology students was so heavy that registration was closed earlier. Start up workshop proved to be true facilitator to students. Workshop included exposure on Plasma technology opportunities in SME sector with demo on Plasma Pyrolysis, Plasma Nitriding, Nano particles Generation by Plasma, Plasma Jet for Biomedical Applications, Plasma for Textiles. Apart from plasma technologies there were sessions on Start up ecosystem and challenges, Incubation and mentoring, Sources of finance for start up, Strategic options for adoption of plasma projects as start up. It was gratifying that some young engineers showed keen interest in start-up initiative.

(L) Prof Amita Das, Dean, IPR addressing the gathering. (R) Organizers of the start-up meeting

Participants of the GTU-IPR start-up workshop along with Shri Abhay Mangaldas

Different Shades of IPR

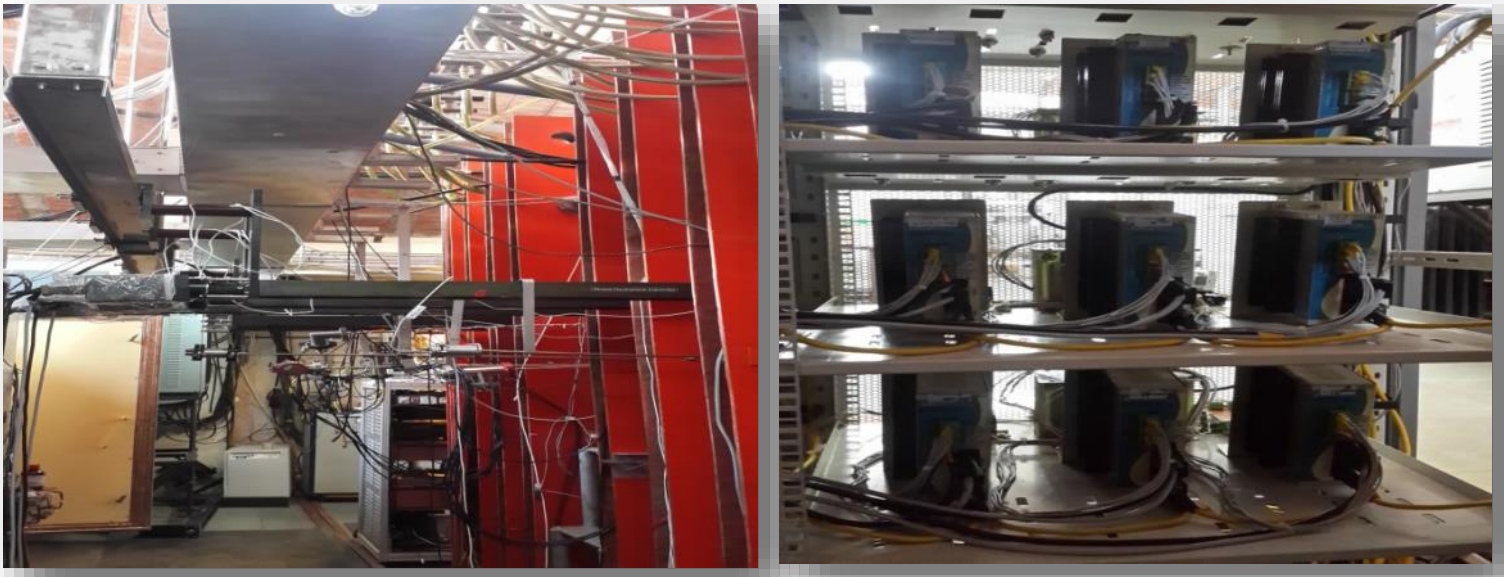


Two contrasting images of IPR. In twilight, when the lights paint a serene picture, and in bright sunshine, where IPR fountains make its own rainbow !

Probe positioning system for Large Volume Plasma Device

The Large Volume Plasma Device (LVPD), is a large, linear double walled, cylindrical shape plasma device of dimension (diameter= 200 cm and Length=300 cm). The device is equipped with 94 ports for diagnostic access. Cantilever effects and positional accuracy, which poisons probe measurements in such large devices because of human intervention, can be largely avoided using this system. In this direction, LVPD has developed software controlled, motorized probe drive systems for unfolding systematic and precise information from plasma.

The system is integrated with the device for 12 numbers of probes using procured precise stepper motor hardware and in-house developed software interface. All the stepper motors are interconnected on 4 wire RS485 interface using Modbus protocol. The software is developed in LabVIEW. In future, this system will be upgraded to cater some more probes mounted from the top side ports. This will facilitate vertical investigation of plasma parameters.



(L) Integrated probe positioning system installed on the LVPD. System. (R) Stepper Motors for controlling translators motion.

Advanced B.Sc. Programme 2016

The Advanced B.Sc, programme, meant for B.Sc. Second year Physics students of colleges in Gujarat for the year 2016 is being organized by the Gujarat Science Academy (GSA) and Vikram A. Sarabhai Community Center, Ahmedabad as a 3-week residential programme during the ongoing summer vacation. This annual programme is being funded by GUJCOST and supported by INSA, IPR and PRL, and is being hosted by St. Xavier's College, Ahmedabad, this year. There are 35 students from all over Gujarat participating in this year's programme.

From IPR, Raj Singh is teaching Mathematical Physics with tutorial assistance from Arghya Mukherjee and Amit Patel, while Rajesh Kumar is taking Electro-Magnetic theory with teaching assistance from Lavkesh Lacchvani and Quantum Physics is being covered by faculty from PRL

The participants of the advanced BSc course at St. Xavier's College, Ahmedabad with the organizers and faculty from IPR.

प्लाज्मा अनुसंधान संस्थान में आयोजित नगर राजभाषा कार्यान्वयन समिति की छठी छमाही बैठक

प्लाज्मा अनुसंधान संस्थान में दिनांक 26 अप्रैल, 2016 को नगर राजभाषा कार्यान्वयन समिति की छठी छमाही बैठक का आयोजन किया गया। यह बैठक गांधीनगर में स्थित केन्द्र सरकारी कार्यालयो/उपक्रमों/बैंकों में राजभाषा हिन्दी में हो रही गतिविधियों पर चर्चा करने के साथ उससे जुड़ी समस्याओं के समाधान हेतु एक सशक्त मंच प्रदान करती है। इस बैठक में दीप प्रज्जवलन के बाद श्री राज सिंह, अध्यक्ष, राजभाषा कार्यान्वयन समिति ने मंच पर आसीन महानुभावों का स्वागत किया और आईपीआर की वैज्ञानिक एवं राजभाषा संबंधी गतिविधियों का संक्षिप्त परिचय दिया। नराकास की यह छठी बैठक मंच पर आसीन श्री अविनाश किशोर सहाय, अध्यक्ष, नराकास एवं प्रधान आयकर आयुक्त, गांधीनगर की अध्यक्षता में संपन्न की गई। सदस्य-सचिव के रूप में श्री पी.बी.मकवाना, देना बैंक, अंचल कार्यालय ने बैठक की कार्रवाई शुरू की। पिछली बैठक में लिये गये निर्णयों पर की गई कार्यवाही की सर्व सम्मति के बाद पुष्टि की गई। नराकास गांधीनगर ने इस वर्ष से पुरस्कार योजना शुरू की है, जिसके अंतर्गत इस बैठक में वर्ष 2015-16 के लिए राजभाषा के क्षेत्र में श्रेष्ठ कार्यनिष्पादन हेतु गांधीनगर स्थित सदस्य कार्यालयों को सम्मानित किया गया। देना बैंक, अंचल कार्यालय गांधीनगर को प्रथम पुरस्कार, केन्द्रीय रिजर्व पुलिस बल, गांधीनगर को द्वितीय पुरस्कार, प्रधान आयकर आयुक्त, गांधीनगर को तृतीय पुरस्कार एवं प्लाज़्मा अनुसंधान संस्थान, गांधीनगर तथा जनगणना कार्यालय, गांधीनगर को सांत्वना पुरस्कार से सम्मानित किया गया। पुरस्कृत कार्यालयों में राजभाषा संबंधी कार्यों से जुड़े कर्मचारियों को उनके उल्लेखनीय योगदान के लिए सम्मानित किया गया। सुश्री संध्या दवे, हिन्दी अनुवादक, प्लाज्मा अनुसंधान संस्थान को कार्यालय में राजभाषा कार्यान्वयन में उल्लेखनीय योगदान के लिए सांत्वना पुरस्कार के रूप में शील्ड और प्रमाणपत्र दिया गया। नराकास के तत्वावधान में आयोजित प्रतियोगिताओं में विजेता के रूप में आईपीआर की सुश्री हिरल जोशी, वैज्ञानिक सहायक को आशुभाषण प्रतियोगिता के लिए द्वितीय पुरस्कार एवं वाद-विवाद प्रतियोगिता के लिए प्रथम पुरस्कार तथा सुश्री शिल्पा खंडकर, वैज्ञानिक सहायक को वाद-विवाद प्रतियोगिता के लिए सांत्वना पुरस्कार प्रदान किया गया। बैठक के अंत में श्री राजसिंह ने मंच पर आसीन महानुभावों और आगंतुकों को संस्थान की ओर से एक स्मृति चिन्ह प्रदान किया जिसपर हिन्दी के प्रचार-प्रसार में एक आदर्श सूक्ति अंकित की गई है।

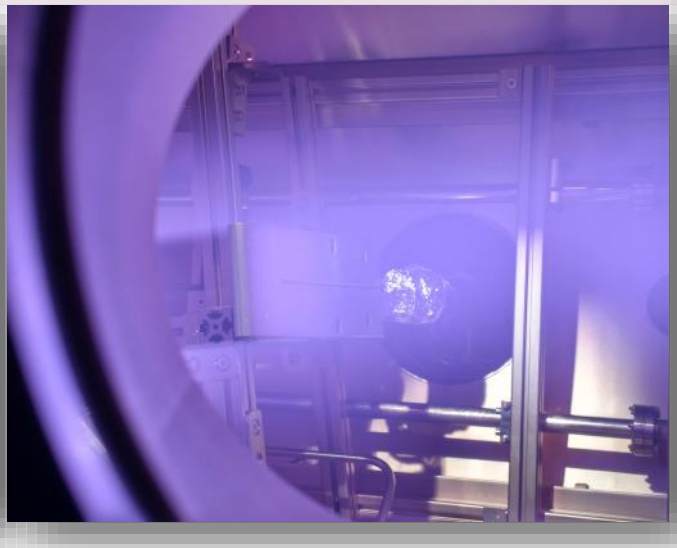



छठी छमाही बैठक की झलकियाँ

IPR-CEA Collaboration Report

Mr Shailesh Kanapara had been deputed from the Divertor and First Wall Technology Development Division, IPR for "Training on development of Tungsten (W) coating technologies for plasma facing component application" under IPR-CEA,IRFM collaboration project, CEA-IPR STC No.3 dated 15/06/2015 from 8th January to 4th May 2016 (4 months).

During training period, under the guidance of Mehdi Firdaouss and Marc Missirlian, from GCFPM group, IRFM-CEA he had actively participated in reception procedure for W coated PFC of WEST, HHF testing of W coated PFC (prototype) as well as got training/awareness on know how procedure for development of W coating by various coating processes like PVD and VPS used for fabrication of PFC of WEST. He was also involved in the HHF testing of W coated Baffle at IPP, Garching (Germany), as well as at St. Gobain Coating Solution Company (Avignon, France) for VPS facility visit which is used for W coating on CFC (WEST antenna protection).



(L-R) Garching LArge DIvertor Sample (GLADIS) facility, IPP-Garching (Germany) ; Screenshot of W coated Baffle component while beam ON during HHF testing in GLADIS ; W coated Baffle component after HHF testing.

Stain Removal by Nanotitania

At FCIPT, nanoparticles of titanium dioxide were prepared by thermal plasma process in air ambient at atmospheric pressure. An electric arc struck between two titanium electrodes evaporated the metal electrode which in air ambient formed nanoparticles of titanium dioxide of average size 25 – 40 nm. Nanoparticles of titanium dioxide are known photo catalyst as well as UV protection agent. The photocatalytic property is employed for stain removal in fabrics apart from other applications.

When stain falls on a fabric coated previously with nanotitania particles can be simply exposed to sunlight for duration of time and the stain gets removed without the necessity to wash. Basically the nanotitania absorbs the UV component of sunlight and in the presence of moisture and oxygen in the atmosphere creates radical oxygen which being highly reactive breaks down the organic stain molecules into its constituents and releases into the atmosphere, thereby removing the stain.

Literature suggests a typical duration of 15 – 20 hrs exposure to sunlight required for stain removal. However the thermal plasma process of nanoparticle production has resulted in nanoparticles with certain properties that has been able to remove stains like coffee, turmeric etc. in over 5 – 6 hrs exposure to sunlight (done under controlled solar simulator).

Picture shows the electron microscopy image of titania nanoparticles (left side) followed by turmeric stain on nanotitania coated fabric before (middle) and after exposure to sunlight (right side)

Building Update




Top L-R : Pump house, birds eye view of the laboratory building work up to plinth level. **Bottom L-R** : Retaining wall at the boundary of the auxiliary lab building, Auxiliary lab building steel superstructure being placed at the building site.

IPR Divisions & Groups - Administration Section - 2

Administration Section- 2 **:** One of the three Administrative divisions of the Institute , the Administration Section- 2 touches upon all vital aspects of Human Resource management from recruitment and staff reviews to individual wellbeing and daily routine personnel management. IPR's elaborate contributory medical facility, the CHS , is taken care of by this group. Postal mail despatch and receipt as well as the courier services , issue and maintenance of Identity cards, recording staff movement through the RF ID based Access Control System, reception and telephone communications are managed by this group. The division handles the important responsibility of legal and RTI matters and also arranges releasing advertisement on recruitments and tenders.

(L to R) Mrs. Rekha Singh, Ms. Hetal Pathak, Mrs. Rakhi Singh, Ms. Falguni Dave, Mr. Sunil Misal, Mr. A. E. Harvey, Mr. B. P. Chauhan, Mr. Silel Shah and Mr. Manesh V. Rathod.

Past Events @ IPR

- ***Mr. Satish Badgujar,*** ITER Organization, France, gave a talk on “Realization of the Cryoline System for ITER” on 29th April 2016
- ***Prof. Krishna Kumar,*** Department of Physics, Indian Institute of Technology, Kharagpur, West Bengal, gave a talk on “Fluid patterns in thermal convection with rotation” on 12th May 2016 (Colloquium # 259)
- ***Mr. Sandeep Rimza,*** DGFS- Scholar, Institute for Plasma Research, Gandhinagar, gave a talk on "Studies on Helium Cooled Plasma Facing Components for tokamak based Fusion Reactor Applications" on 17th May 2016
- ***Mr. Shailesh Kanpara,*** Institute for Magnetic Fusion Research, IRFM-CEA, Cadarache, France, gave a talk on "Development of Tungsten (W) Coating technologies for Plasma Facing Component application" on 20th May 2016
- ***Dr. Gopikishan Sabavath,*** Birla Institute of Technology, Mesra, Ranchi, gave a talk on "Plasma parameters and instability during thin film deposition" on 25th May 2016

Upcoming Events

- 12th International Colloquium on Atomic Spectra and Oscillator Strengths for Astrophysical and Laboratory Plasmas, Universidade de So Paulo, Brazil, 4-7 July 2016 http://www.iag.usp.br/astronomia/asos12/
- 43rd European Physical Society Conference on Plasma Physics (EPS 2016), Leuven, Belgium, 4-8 July 2016 https://kuleuvencongres.be/eps2016
- 23rd Europhysics Conference on Atomic and Molecular Physics of Ionized Gases (ESCAMPIG), Bratislava, Slovakia, 12 -16 July 2016 http://www.epsnews.eu/2016/03/escampig-xxiii/
- 2016 Joint ICTP-CAS-IAEA School and Workshop on Plasma-Material Interaction in Fusion Devices, Hefei, Anhui Province, China, 18-22 July 2016 https://www-amdis.iaea.org/Workshops/ICTP2016Hefei/
- Prospects in Theoretical Physics 2016: Computational Plasma Astrophysics, Institute for Advanced Study, Princeton, New Jersey, 18-29 July 2016 https://pitp.ias.edu/
- 4th Superconductivity Summer School, Wolfson College, University of Oxford, UK, 20-22 July 2016 http://super2016.iopconfs.org/home

Know Our Colleagues

Mr. Narendra N. Kadamdhad joined IPR in 1996 in the drafting section which take care of all engineering drawings at the Institute. He has been Visiting researcher at ITER IO France in 2013 and got selected there in open position in Nov 2014 . He is working in Tokamak Cooling water section under Plant Engineering Division. He is involved in the activities related to drawing for the Integrated Blanket Edge Localized Mode and Divertor (IBED) Primary Heat Transfer System, NBI PHTS and Sampling station system

An Electrical & Power Electronic Engineer by profession with Energy Management (EM) and Project Management Professional (PMP) as specialized portfolios, **Mr Ashok Mankani** joined the Institute in 1996 in the SST-1 Power Supply Section. He has been playing key roles in design, engineering, installation, commissioning, operation and maintenance of 132 kV Sub-station and associated power distribution system and also the magnet power supply and associated protection systems at IPR. He was also a pioneer member of Coil Power Supply Section in Electrical Engineering Division of ITER during his deputation period in France and there he was Technical Responsible Officer (TRO) of world largest state of art Static Var Compensation (SVC) based 66 kV, 750 Mvar Reactive Power Compensation & Harmonic Filtering (RPC & HF) System as well as the Integrated Electrical System Modelling and Simulation. Currently he is executing 33 kV Sub-station project for CPP-IPR, Guwahati. His core field of interests and skills are in Power System Engineering, Power Stability & Quality and Energy Management.

The IPR Newsletter Team

Ritesh Srivastava	Tejas Parekh	Ravi A. V. Kumar	Priyanka Patel	Swati Roy	Mohandas K.K.
Suryakant Gupta	Ramasubramanian N.	Chhaya Chavda	Shravan Kumar	Hiral B Joshi	

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

प्लाज़्मा 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