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The Fourth State

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

Vacuum Electronic Devices Conference

The National Conference on Emerging Trends in Vacuum Electronic Devices and Applications (VEDA) was hosted by IPR in in collaboration with the Vacuum Electronics & Applications Society, Bengaluru during 16-18 March 2017. The event was inaugurated by Dr. Shashank Chaturvedi, Director IPR, Dr. Sushil Raina, President VEDA Society and Dr. Sudhir Kamath (Director, MTRDC), who also delivered the keynote address. The meeting had six plenary and sixteen invited talks by leading experts in the fields of vacuum devices and high power microwaves. The meeting also had oral presentations as well as a poster session. Around100 participants from various R&D institutions and Universities took part in this event.

Images from the VEDA meeting held at IPR

46th National Safety Week @ IPR

The 46th National Safety Week was celebrated at IPR during 4-10 March 2017. The institute organized various competitions in this week to create safety awareness among the employees. Competitions include *Slogan in Hindi & English*, *Cartoon Making*, *Quiz and Essay Writing in Hindi & English* based on decided topics for the employees of IPR, FCIPT & ITER-India. Encouraging response was received from the employees for various competitions. A hands-on demonstration for using fire extinguisher was conducted for the employees as well as security staff at IPR, FCIPT and IPR Extension labs as a part of the Safety Week. A demonstration of self-contained breathing apparatus (SCBA) was also conducted for the employees, specially for those who work with cryogenic fluids. The concluding session was organized on 10th March 2017. Mr. Devendra Modi welcomed the gathering and Mr. Rajiv Sharma made a presentation on "*Experience with Cryogenic Safety, Problems and Solutions*". This was followed by a talk by Dr. Chenna Reddy who expressed his thoughts on safety at work. The safety pledge was then administered to the staff by Shri. P K Atrey. This was followed by a safety quiz conducted by Shri Bharat Doshi. IPR Director then delivered the keynote address and gave away the prizes to the winners of various competitions organized during the safety Week. The vote of thanks was delivered by Shri Sunil Kumar, Chairman, Safety Committee.

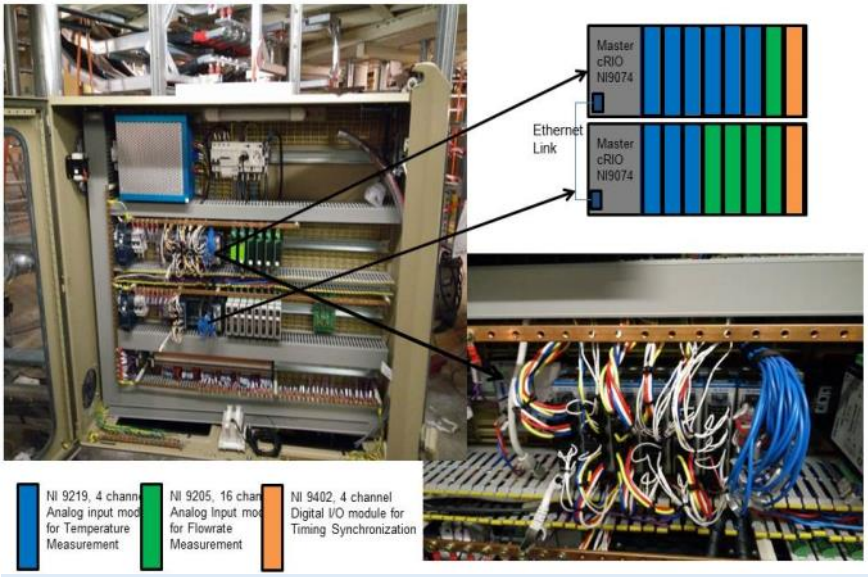



Competition	1st Prize	2nd Prize	3rd Prize
Hindi Slogan	Sunil Misal	Nitin Bairagi	Sandhya Dave L.N. Gupta
English Slogan	Kiran Ambulkar	Sunil Misal	Jatin Kumar Patel
Cartoon	Suman Aich	Unnati Patel	-
Quiz	Shravan Kumar	Atul Garg Pratibha Gupta	Prakash Parmar Vrushank Mehta
Hindi Essay	Pratibha Gupta	Sandhya Dave	K.G.Parmar
English Essay	Alphonsa Joseph	Hiral Joshi	Bharat Doshi

(Clockwise, from top) Mr. Rajiv Sharma delivering his talk ; The safety oath being administered ; Dr. Chenna Reddy and Dr. Shashank Charurvedi addressing the gathering ; Director, IPR giving away the prizes ; list of winners of the various competitions.

IPR-CEA Collaboration

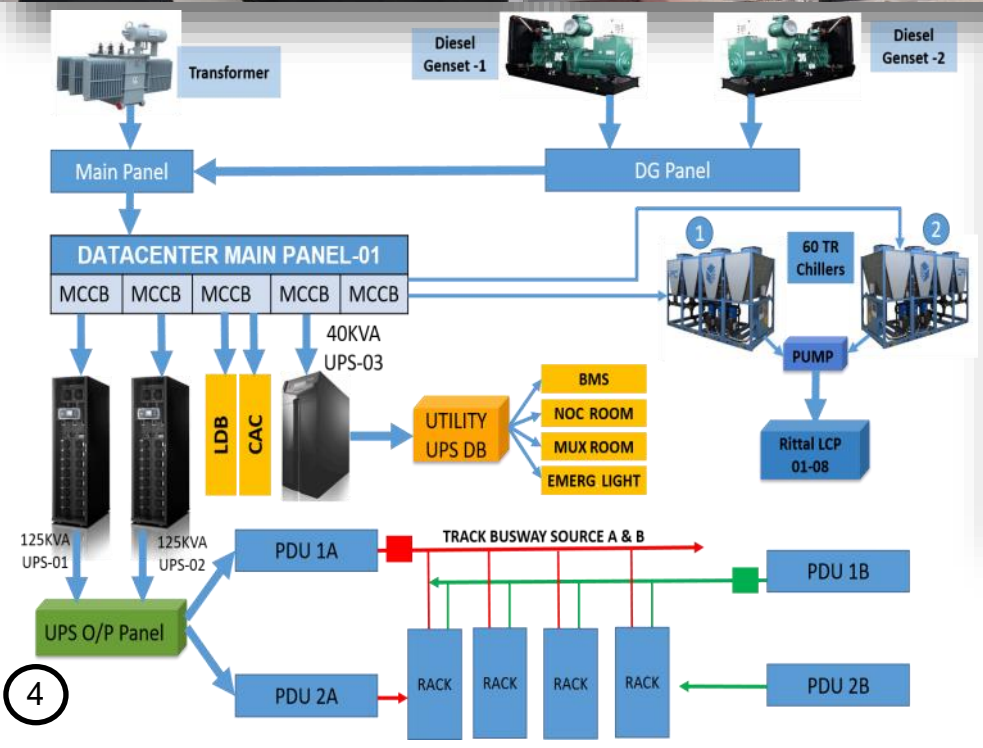
Ms. Chhaya Chavda had been deputed from Aditya Data Acquisition and Control Division, IPR, for working on the WEST tokamak project in France. She worked with STEP (Service Tokamak Exploitation & Pilotage) group under the guidance of Mr. Benjamin SANTRAINE, Ms. Nathalie RAVENEL and Dr. Philippe MOREAU. She was assigned to work for two different diagnostics: Calorimetry and MHD. She was also assigned Coordinative Managerial work during deputation at CEA for IPR team and CEA. She had developed 1) cRIO based boards interface host application in "C" for continuous data acquisition unit for Temperature and Flowrate measurement and its interface with TSDaq for Calorimetry Diagnostic and 2) PXI based boards interface host application using "C" for data acquisition unit for Magnetic Instability measurement at High frequency for MHD Diagnostic and its interface with 'TSDAQ'. The Calorimetry Diagnostic System was installed in Tokamak hall cubicle and at Electronics corridor for data acquisition and was tested for Pulse mode operation while for MHD diagnostic; the program was developed and debugged. Under the coordinative managerial work she was assigned to manage weekly work report meeting, meeting with other IRFM technical division for visit / discussion, ITER visit, mange for OFII, Medical emergency, Insurance, CEA work report for IPR Newsletter, Accommodation, Cultural and Social Events etc.

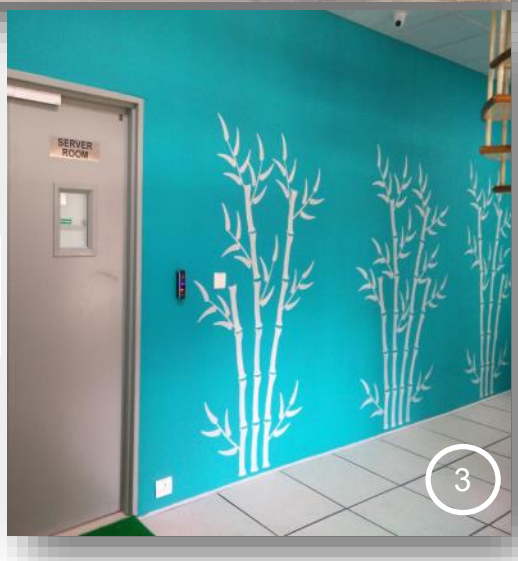


Calorimetry diagnostics hardware for the TORE-SUPRA tokamak

IPR Data Center

The state-of-the-art data center at IPR is now operational. Spread over an area of ~95 sqm, this 14 rack facility with in-rack cooling and many levels of protection will cater to the current and future computing / IT needs of IPR. To support this facility, a dedicated cooling system as well as a robust UPS system, both with backups have also been established. The health of the racks and other support systems can be remotely monitored to ensure a 24x7 operation of the data center. The main features of this Data center are ; (a) Complies with the TIER 3 international standard (ANSI/TIA-942 standard) (b) Installed modular UPS of 250kW capacity (125KW in N+N mode), upgradable to 400KW (c) Two air cooled scroll chillers (60TR capacity each) functioning in N+N mode (d) In-rack cooling system (Liquid Cooling Package) with cooling capacity of 40KW each LCP (e) Dual independent electrical distribution paths serving the IT equipment / racks. All critical and core IT equipment installed in Data Center are dual-powered (f) Fire rated (120 min) partitions, doors, false floor, false ceiling etc. The 360 Degree view of the data center can be seen HERE.





Clockwise (from top) (1) The birds-eye view of the data center (2) The chillers mounted on the terrace (3) The entrance of the Data center (4) The schematic of the electrical layout of the Data Center (5) the UPS and electrical distribution room.

Inauguration of IPR Data Center

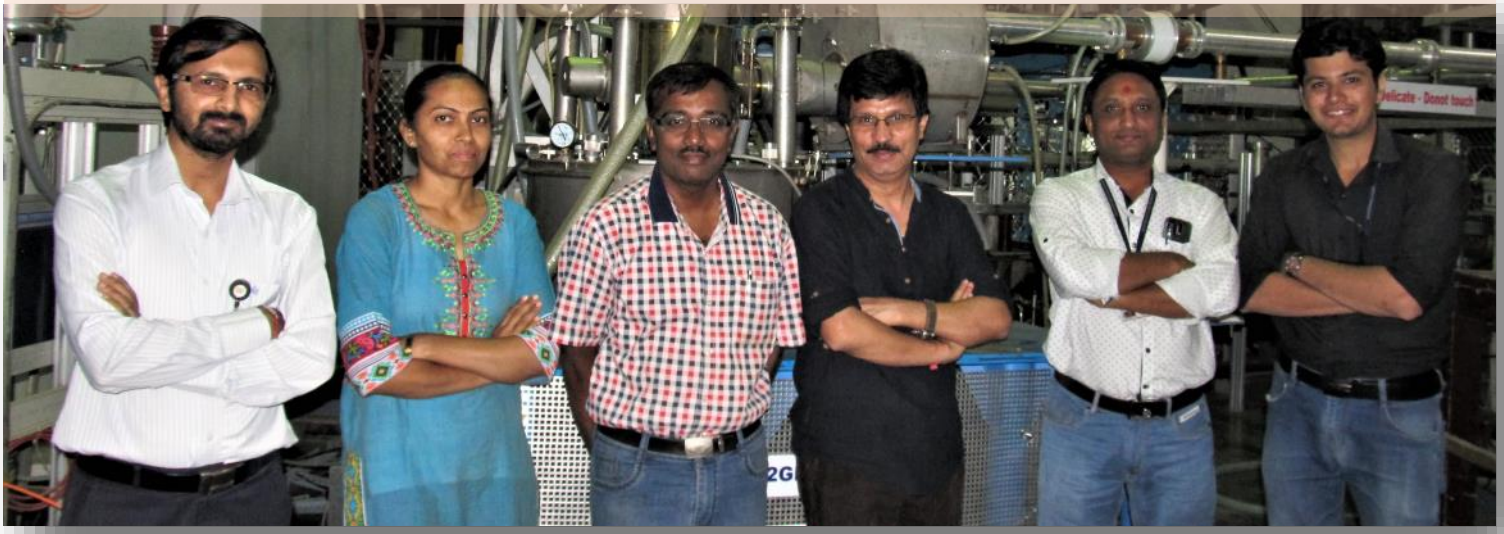
The new IPR Data Center was inaugurated by the Director, Dr. Shashank Chaturvedi on the 28th of March 2017. The inauguration was attended by several IPR staff. The 360 images of the inauguration can be seen HERE and HERE




Images from the inauguration ceremony of the new IPR Data Center.

IPR Divisions & Groups - High Power ECRH Group

The High Power Electron Cyclotron Resonance Heating (ECRH) Division is responsible for reliable plasma start-up and other heating experiments in tokamaks SST-1 and Aditya. The 42GHz-500kW-500ms and 82.6GHz-200kW-1000s ECRH systems are used in tokamaks SST-1 and Aditya Upgrade. The 42GHz ECRH system has delivered several interesting results on SST-1 and Aditya. This system has become an integrated system for SST-1. The ECRH division is actively involved in the developments of advance technologies related to high power microwave and high voltage. The achievements of the division are the successful ECRH system on tokamak, development of Ignitron based crowbar system and other solid state High Voltage systems.



Group Members (L to R) :Dharmesh Purohit, Harshida Patel, N. Rajan Babu, Braj Kishor Shukla , Jatinkumar Patel and Hardik Mistry.

Holi Celebrations @ IPR

Holi, the festival of colors was celebrated with a lot of fun and gaiety at IPR on 10th March, 2017., two days ahead of the actual date of the festival. Along with playing with natural colors, over 300 IPR staff members who took part in the event enjoyed snacks and refreshing drinks before leaving the institute for the long "holi" weekend.





Images from the "Holi" celebrations held at IPR

46th National Safety Week @ CPP-IPR

46th National Safety Week Campaign was observed with immense enthusiasm at CPP-IPR. Observations included a Slogan (both in Assamese and English) and Quiz competition among the employees. Total of 41 nos. of slogan were received. On the Inaugural day on 06/03/2017, the programme was started by an introductory speech on "Safety Awareness" by Mr. Mriganka Bezbaruah, Project Engineer (Civil) and later a quiz competition among the employees was held where total 31 nos. of staff members participated. The last day of the NSW campaign was on 10/03/2017 and the day started with a welcome speech by Mr. Amarendra Baishya, Safety Coordinator, followed by the award distribution ceremony for winners of Slogan and Quiz competitions.


Competition	Prize
Assamese Slogan	1st : T. K. Borthakur 2nd :Manoj Kr. Deva Sarma
English Slogan	1st : Monojit Chakraborty 2nd : Anupam Bujarbaruah
Quiz	1st : B.K. Saikia 2nd : Monojit Chakraborty, Hemanta Sharma, 3rd : S.R. Mohanty, Trinayan Sarma, N Aomoa

ITER-India News

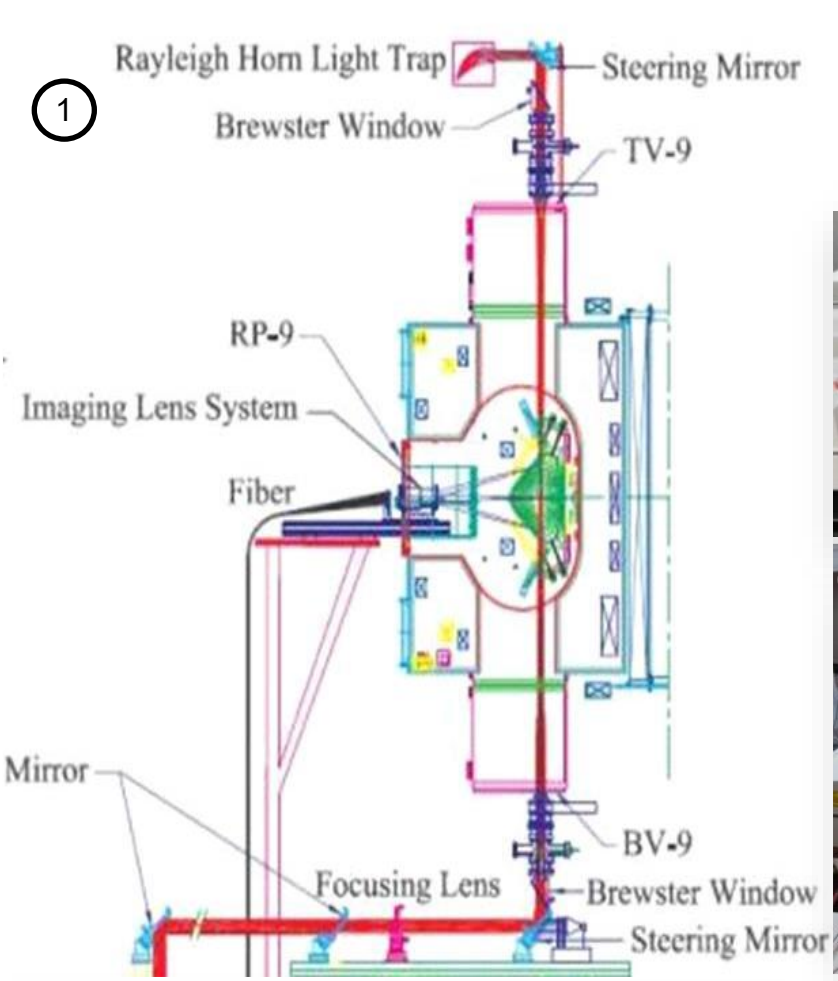
Six sectors of Cryostat Lower Cylinder Tier-1 (weighing around 240 tons in total) manufactured at Larsen & Toubro, Hazira have been delivered to ITER. These heavy components started their marine journey from the port of Hazira during end of January 2017 and reached the French Port of Marseille in the last week of February 2017. The components finally arrived one by one in the Cryostat workshop at ITER site during March 2017, where further sub-assembly / fabrication activities will be carried out.

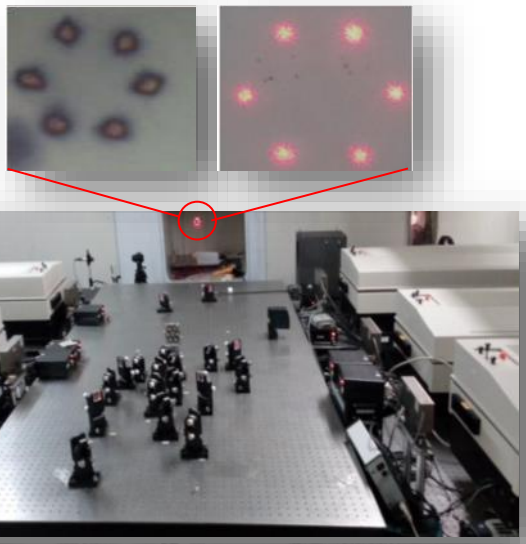

(L) Loading of one of the six Cryostat Lower Cylinder Tier-1 sectors at Hazira port (R) Unloading of the sectors in the Cryostat Workshop at ITER site

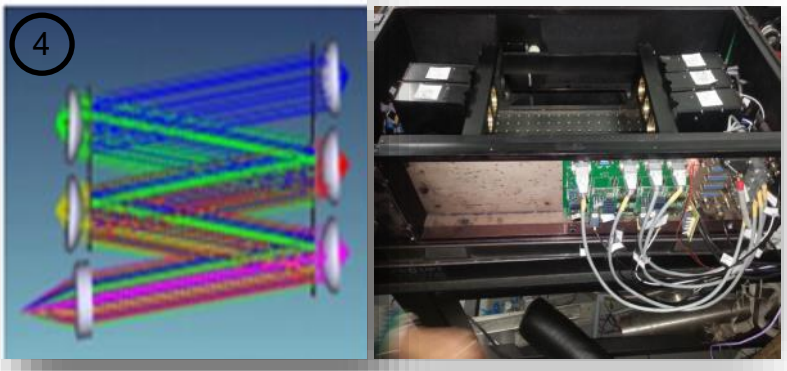
Thomson Scattering is a diagnostics widely used for measuring plasma electron temperature and density in present day tokamaks. Thomson scattering is the scattering of Photons from charged particles (like electron or ion). The technique is named after J.J. Thomson, who developed the theory of scattering of electromagnetic radiation by electrons in 1907.

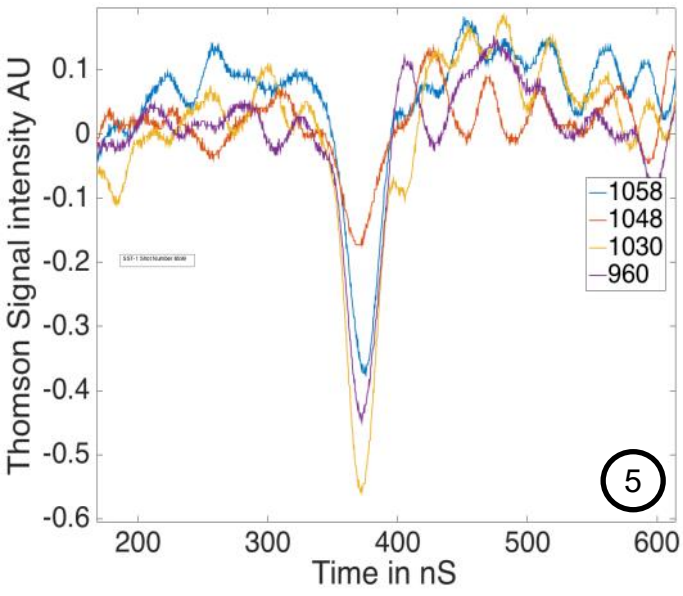
The plasma consists of ions and electron moving with very high speed. The chances (probability) of photons getting scattered from such an electron or ion is extremely low. Hence Thomson scattering was not considered as a plasma diagnostics tool till the advancement in laser technologies. In 1969, using a ruby laser system having nano-second pulse width (1/100,00,00,000 of second) and large number of photons ($1x10^{18}$ number of photons), the Thomson scattered signal was detected in a tokamak plasma. The measured plasma temperature using Thomson Scattering on this tokamak was in the range of 11 million degree Kelvin. Since then, the Thomson Scattering was extensively used by almost all major tokamaks around the globe.

The SST-1 Thomson Scattering system uses six Nd:YAG lasers for electron temperature and density measurements. The laser beams from all the lasers are aligned as a hexagonal laser beam pack. This hexagonal laser beam pack is sent to the tokamak and a lens focuses all the laser beams on to the plasma. The scattered photons collected by another lens system are transported back to the lab using optical fibers. On analyzing the property of the scattered photon using the specially designed instrument, the temperature and density of the plasma can be estimated.









(1) The schematic of the Thomson Scattering diagnostics (2) the optics to combine the 6 laser beams (inset : pattern of the 6 aligned laser beams (along with marker lasers) (3) The six Nd:YAG lasers mounted for operation.(4) Ray tracing of the Optical instrument for characterizing the scattered photons and the filter polychromator. (5) The Thomson scattered signals at various wavelengths recorded for SST-1 plasma shot #8599 .

Congratulations !

Professor Subroto Mukherjee, Head, FCIPT and Associate Dean, Academics, was awarded (jointly with Dr. S C Sharma of ISRO, Thiruvananthapuram) the VASVIK Award for the year 2016 in the category of Material & metallurgical Sciences & Technology. This award is instituted by the Vividhlaxi Audyogik Samshodhan Vikas Kendra, Mumbai. The award was presented to him by Shri Pankaj Patel, President, Federation of Indian Chambers of Commerce & Industry (FICCI) during the ceremony organized at BJ Hall, Vile Parle, Mumbai on 3rd March 2017.

On behalf of IPR, we extend our hearty congratulations to Prof. Mukherjee.

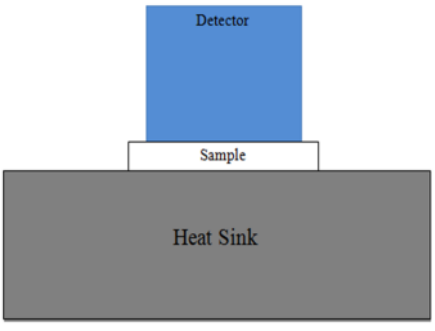
Fully Automated Plasma Pyrolysis System at Smart City in Gandhinagar

Recently, a small prototype fully automated plasma pyrolysis system of 150kg/day capacity has been installed and commissioned by IPR's technology licencing partner M/s B L Engineering at the Gujarat International Finance Tec-City (GIFT city), Gandhinagar in consultation with IPR. This system is controlled by PLC and HMI based automation that provides fully automated plasma torch operation. It also provides a fully automated waste feeding operation in which two different types (STP and Solid waste) of waste are fed from two ports which are nearly 30-40 meters away from the system. It also has redundancy in various subsystem operations. The total unit has a compact footprint of ~ 4 meter x 10 meter with a height of 8 meters.

Plasma Pyrolysis Plant of 150kg/hr capacity in Smart city (GIFT city Gandhinagar)

Thermal Emissivity Measurements

Thermal emissivity is an Important characteristic of any surface. Any system where heat loads and cooling is an important aspect to be considered in design, emissivity of the surfaces being used should be known and modified appropriately. This measurement setup is available with the Prototype Vacuum vessel and Pellet Injector Division.



(L) The schematic of the Thermal Emissivity measurement device (R) The device.

Temperature range	Room Temperature
System accuracy	+/- 0. 02%
Sample type	Compatible with any material surface
Repeatability	+/- 0.02 % of standard
Least count	0.01
Measurement time	Warm up time 30 mins, measurement time <5 minutes for each sample

Past Events @ IPR

- ***Dr. Subrata Pradhan,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Doping-induced super-lattice-like structure in the isotopic $Mg^{11}B_2$ bulk superconductor for fusion applications" on 23rd March 2017

Upcoming Events

- Sherwood Fusion Theory Conference (Sherwood 2017), Annapolis, USA, 1-3 May 2017 http://www.sherwoodtheory.org/sw2017/index.php
- 14th CRYOGENICS 2017 IIR International Conference-2017, Dresden, Germany, 15-19 May 2017 http://www.cryogenics2017.eu/
- 16th International Conference on Plasma-Facing Materials and Components for Fusion Applications, Neuss/Dusseldorf, Germany, 16-19 May 2017 http://www.fz-juelich.de/conferences/PFMC2017/EN/Home/home_node.html
- 8th International Conference on the Physics of Dusty Plasmas, Prague, Czech Republic, 20-25 May 2017 http://physics.mff.cuni.cz/kfpp/8icpdp/
- 44th International Conference on Plasma Science, Atlantic City, New Jersey, United States of America, 21-25 May 2017 http://www.shu.edu/international-conference-plasma-science/
- 10th International Conference CHAOS 2017, Barcelona, Spain, 30 May - 2 June 2017 http://www.cmsim.org/

Congratulations !

Mr. Praveenlal E V of the Aditya Data Acquisition and Control Division of IPR received the award for the best paper in the category "**Applied Electronics and System Engineering**" at the International Conference on Advances in Electrical, Electronic and Systems Engineering-2016 (ICAEESE 2016), held at Putrajaya, Malaysia, during 14-16 November 2016. He received the award from Prof. Norbahiah Misran, Head, Department of Electrical, Electronic & System Engineering, UKM University, Malaysia.

His paper was entitled "***Design and Implementation of Electromagnetic Diagnostics Electronics in SST-1 Tokamak"*** was co-authored by, Chandresh Hansalia, Rachana Rajpal, Hitesh Mandaliya, Vismay Raulji, Sameer Kumar and Raju Daniel

Know Our Colleagues

Mr. Manu Bajpai joined IPR as technical trainee in the year 1997 after graduating in Physics from IIT Kanpur in the same year. As a scientist in IPR, he has worked in Plasma Diagnostics, Antimatter Plasmas and Non-neutral Plasmas. He has been associated with the magnet division of RRCAT and the pioneers in Antimatter Physics from UCSD and Swansea and worked on elastic and inelastic buffer gas cooling of Electron-Positron Plasmas. His research interests include Beam Steering Dipole Magnets, Charge Particle Traps, Gravitational and Electromagnetic Interactions of Antimatter. He has been leading the project on pure electron plasma (SMARTEX-C) for last few years. His team, working on SMARTEX-C, and its collaborative activities with experimental physicists at BARC-Vishakhapatnam has made the 100ms long plasma shot to extend up to 4s and showcase other striking features.

Mr. Shailendra Trivedi joined IPR in 1998 and initially worked as a programmer developing and managing various in-house developed software. Later on he took care of procurement, installation, configuration, administration, security and maintenance of various Linux/UNIX/Windows servers and workstations and also in the setting up and management of high performance computing at IPR computer centre. He installed and configured email servers for the emails to be accessed through https://webmail.ipr.res.in. His works also included procurement, installation, configuration and maintenance of network routers and switches. Earlier, he has also been involved in procuring IT hardware like servers, workstations, desktop PCs, printers and peripherals for IPR employees. He had also supported the high computing CRAY facility operations.

The IPR Newsletter Team

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