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The Fourth State

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

IPR Signage at Main Gate

IPR campus got its signage at the main gate. The stainless steel signage with IPR logo, mounted on polished granite background was completed on 28th Oct 2016.

IPR @ Brics Young Scientist Conclave

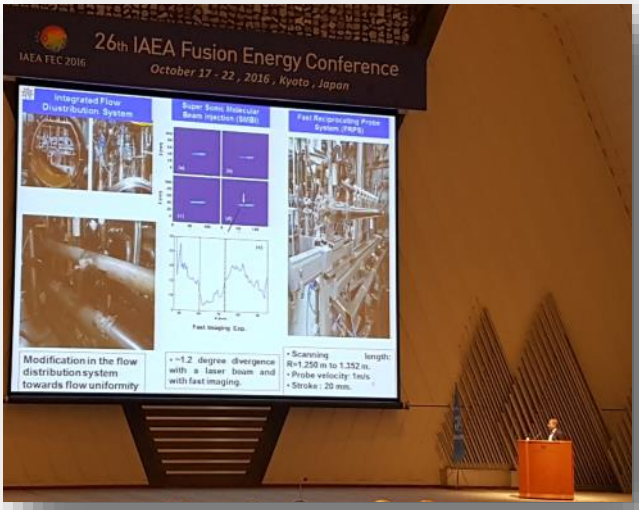
India hosted the BRICS Young Scientist Conclave during 26-30 September 2016 at the National Institute of Advanced Studies (NIAS), Bangalore. This meeting was aimed at providing opportunities to engage and network young and talented scientists and technocrats in the various areas of R&D in the BRICS member countries. Ten individuals were selected from the BRICS nations to discuss the common problems in Computational Intelligence, Energy Solutions and Affordable Healthcare. For this meeting, **Mr. Akshay Vaid** from FCIPT was selected for his contribution in the area of development of plasma jet for bio-medical applications.

The participants of the BRICS Young Scientist Conclave held at Bangalore in September, 2016

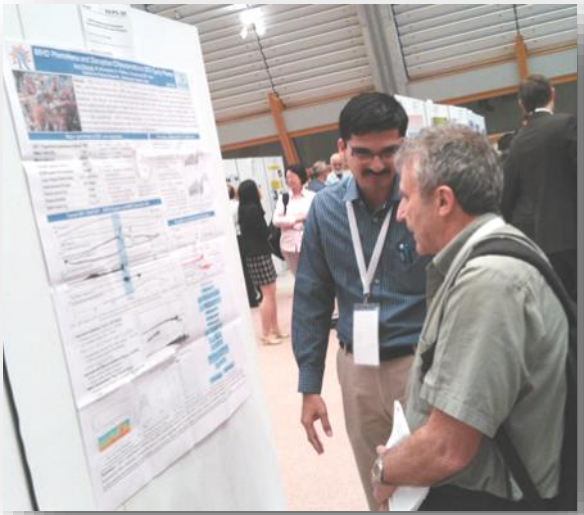
IPR @ FEC-2016

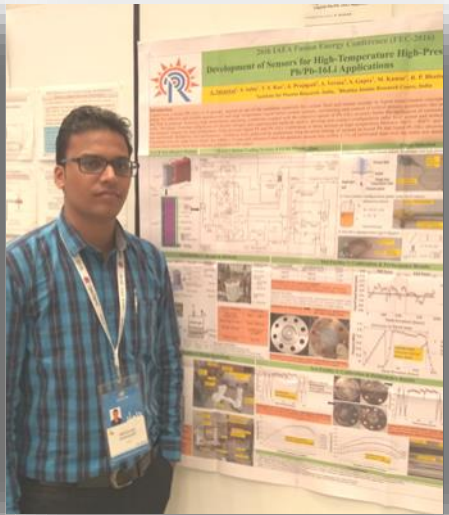
The biennial IAEA event, “26th IAEA Fusion Energy Conference” (FEC 2016) held at the Kyoto International Conference & Co Kyoto, Japan from 17-22 October 2016 was attended by a 19 member contingent from IPR which included a 4-member observer team for the FEC-2018 which is proposed to be held in India during October 2018. While oral presentations were made by Subrata Pradhan, Nirmal Bisai, Aparajita Muherjee and Abhishek Saraswat, several posters were also presented at the conference by IPR/ITER-India staff. The observer team had several meetings with IAEA officials as well as the local organizing committee of FEC 2016 regarding organization related matters of the upcoming FEC 2018 in India. The announcement that the FEC2018 would be held in India was also made in the concluding session of the meeting.

The IPR contingent at the IAEA FEC-2016 conference held at Kyoto from 17-22 October, 2016



L-R : S Pradhan delivering his talk ; Joydeep Ghosh and Santanu Banerjee with their poster presentations.





L-R : Jasraj Dhondge, Dilip Raval and Abhishek Saraswat with their poster presentations.

Dr Shishir Deshpande and Mr. Ujjwal Barua from ITER-India with two members from DAE participated in the biannual Management Advisory Committee (MAC) meeting of ITER held during 25-27 October 2016 at ITER-France.

As in the past, this year also, the Indians residing in and around Aix-en-Provence and Manosque organised a get-together on 2nd October, 2016 to celebrate “Navratri” festival with enthusiasm and excitement and of course, traditional attire ! After welcoming all the guests, the “Aarti” was performed with full devotion. Indian cuisine was served by a local Indian restaurant. This was followed by an four hour long “Garba” in which all the guests participated. Such Annual events on the occasion of various festivals enable all the Indians residing in the vicinity to come together along with the members of their family.







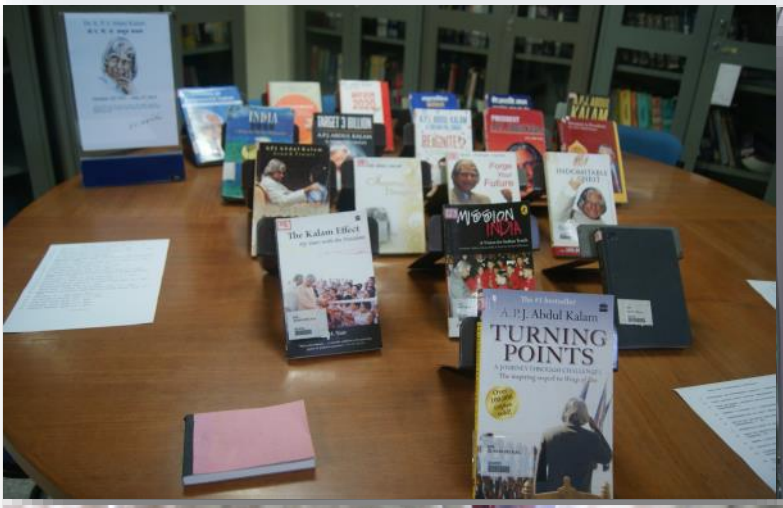




Images from the Navaratri Celebrations at CEA/ITER, France.

Kalam-Chandra Week at IPR Library

IPR Library celebrated Kalam-Chandra Week during 17-21 October 2016 to mark Birth Anniversaries of two great scientific minds, ie, Bharat Ratna Dr A P J Abdul Kalam (DoB: 15 October 1931) and Nobel Laureate Subrahmanyan Chandrasekhar (DoB: 19 October 1910). A collection of their books were exhibited in library, also an Informative poster on Kalam and Chandrasekhar were displayed near the library. Library witnessed many visitors during the week for reading their inspirational books.



IPR Divisions & Groups - Neutral Beam Physics and Mechanical Division of NBI

Neutral beam physics and mechanical division of NBI group is engaged in developing the neutral beam injector (NBI) system for the SST-1 tokamak. The NBI system shall be used for injecting about 1.7 MW of neutral beam (Hº, 30-50 keV) power to the tokamak (SST-1) plasma for performing heating and current drive. The division is responsible for operating the 5 MW positive ion source PINI, beam diagnostics and conducting heating and current drive experiments in SST-1. The responsibilities also include mechanical & thermal components of the beam line, cryo-condensation pumps and the 3.8 K liquid helium cryogenics systems. Currently, the division is engaged in the integration of the NBI system with SST1- tokamak.

L to R : Bhargav Pandya, S. Rambabu, Sanjeev Sharma, Sanjay Parmar, B.Sridhar, V.Prahlad, C.Chakrapani, P. Bharathi, Nilesh Contractor, and Bhargav Choksi

Magnetron Sputtering System @ IPR

Magnetron Sputtering Unit (BC-300) supplied by HHV (Bangalore) was recently installed and commissioned at the Divertor and Firstwall Technology Development (DFD) Division of IPR. Magnetron of this system can be operated at maximum RF power of 300W and substrate can be heated up to 1000 ^{o}C. Vacuum chamber of the system can be evacuated to achieve coatings under high vacuum condition of the order of 1.0E-6 mbar. Various metal targets like Ti, Cu, Cr, Al, W as well as non -metal targets like Graphite can be used for sputter coating. Graphite coatings are specifically useful for achieving uniform high emissivity on surface of samples used for measurement of thermal diffusivity & specific heat using Laser flash unit EM-200 & FL-5000 with DFD division. The system is equipped with vacuum pumping system, gas purging system, PLC controller with HMI touched control panel, substrate holder with heater, substrate rotating function and water chiller for continuous cooling of the vacuum chamber & Magnetron system.

(L) Magnetron sputtering Unit (R) Ti sputtered samples

Civil construction @ CPP-IPR

As part of the infrastructure development of CPP-IPR, construction of Canteen building and site grading works have been started at CPP-IPR. The Canteen building will be a modest single-storied building having ground floor area of 430.00 SQM and external development of 245.5 SQM. It may be noted that CPP-IPR is located on a picturesque hillside at Dispur, around 20 km from Guwahati, the capital of Assam. This is the first major civil construction work at CPP-IPR after its merger with IPR in 2009.

construction of Canteen building and site grading works started at CPP-IPR

Staff Club Activities

The staff club successfully completed indoor tournaments for Chess, Carom and Table Tennis. On behalf of IPR, the newsletter team congratulates all the winners and the participants who made the events successful.The prizes and certificates of the winners and runners up will be distributed on 26th January 2017.

Like every year, the Staff Club is organizing a IPR Cricket tournament between the 12th November 2016 and 18th December 2016. There are eight teams participating in this tournament. There will be 16 league matches, two semi-finals and one final match.

The IPR staff club is also celebrating the 30th Annual day of our Institute on 26th November 2016.

Game	Winner	Runners up
Chess (Male Category)	Rohit Kumar	K P Singh
Chess (Female Category)	Sandhya Dave	Smita Parmar
Table Tennis Single (Male Category)	Bikas Ranjan Dass	Madeena Valli
Table Tennis Double (Male Category)	Vikas Gaur & Bikas Ranjan Dass	Arvind Kumar & Deepak Agrawal
Table Tennis Single (Female Category)	Ayushi Vashistha	Swapnali Khumaru
Carom Single (Male Category)	Vikas Gaur	P. Ajesh
Carom Doubles	P Ajesh & Ronak Shah	Mahesh Patel & Jagrut Bhavasar
Caroms Single (Female Category)	Ayushi Vashistha	Hetal D Pathak

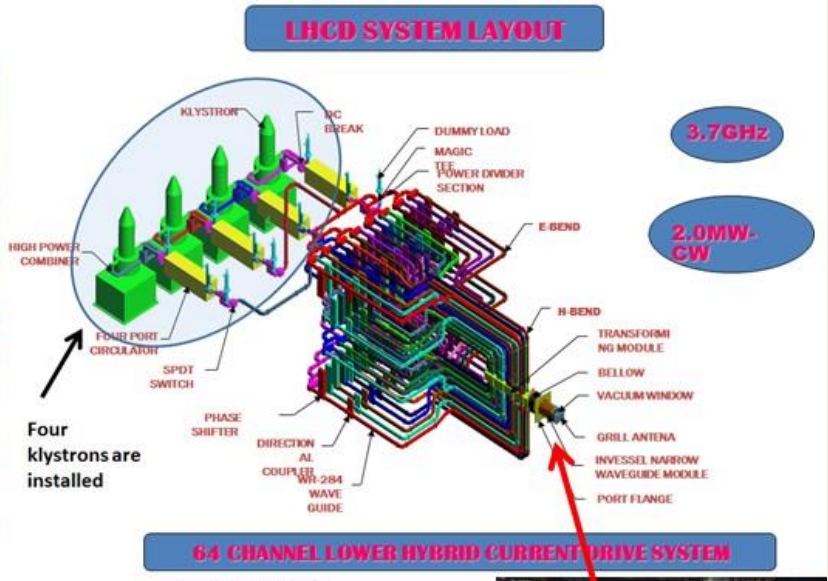
Participate playing Indoor games - Chess, Carom and Table Tennis at IPR

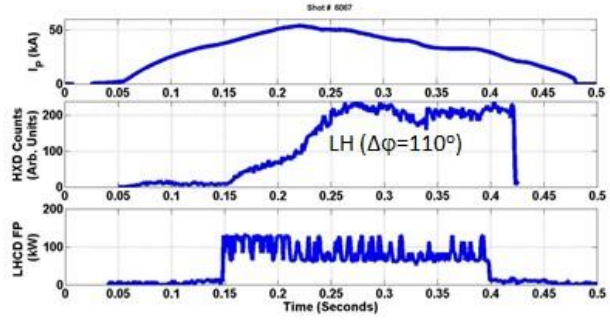
Lower Hybrid Current Drive (LHCD) system

The 3.7 GHz, high power (2 MW) Lower Hybrid Current Drive (LHCD) system was designed, developed and installed on the SST-1 tokamak, to drive plasma current non-inductively, for CW (>1000 seconds) operation. The source comprises of four klystrons, each rated for 500 kW-CW power and are configured to operate in parallel mode with single 70kV/80A, regulated high voltage power supply (RHVPS). Conventional grill type antenna with 64 active waveguides, arranged in two rows, having periodicity of 9mm, each having 32 waveguides is employed to launch lower hybrid waves into the plasma. The LHW's can be launched with varying parallel refractive index as each of the adjacent waveguides can be independently phased with respect to each other, with the help of mechanical phase shifters.

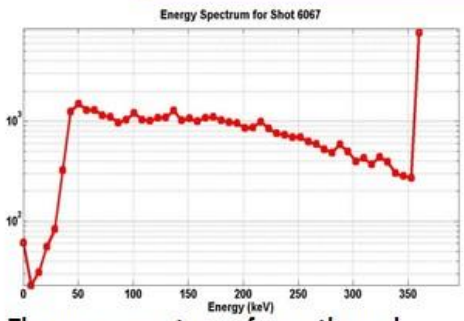
Another 120 kW-pulsed, LHCD system, based on conventional grill antenna having 8 waveguides, arranged in two rows, each having four waveguides, was also designed, developed and installed on Aditya tokamak. It is powered by the same klystrons, which are also used for SST1 LHCD system. As Aditya tokamak is being upgraded, it provides an opportunity to upgrade LHCD antenna system which is being conceived based on Passive-Active-Multi junction (PAM) antenna. The PAM is under development stage.

Encouraging results have been obtained with LHCD system, both on SST1 machine, as well as on Aditya machine. In SST1 machine, LHW's has been launched in to the plasma which helped in elongating the SST1 pulse length up to 500ms. During these ohmically assisted LHCD, the plasma discharges suprathermal electrons, which are generated by LHW's. These have been detected with CdTe detection system which confirms the generation of suprathermal electrons by LHW's. Similarly, ohmically assisted, long pulse discharges (up to 220ms) has been successfully obtained on Aditya machine with the help of LHW's. It has been observed that gas puffing from antenna sides improved edge coupling of the LHW's, thereby producing encouraging results.





Immediate response of CdTe signal with LH pulse shows generation of suprathermal electrons, and confirms wave-particle interaction in SST1 machine.



The energy spectrum of suprathermal electrons generated by launching of lower hybrid waves (LHW) clearly depicts enhancement in the count indicating the interaction of LHW with SST1 plasma.

Past Events @ IPR

- ***Dr. Payal H. Pandit,*** Kadi Sarva Vishwavidyalaya, Gandhinagar, gave a talk on "Direct Measurement of Plasma Potential using Laser Heated Emissive Probes" on 4th October 2016
- ***Dr. Prabal Singh Verma,*** Technische Universitat Berlin, Germany, and Max-Planck/Princeton Center for Plasma Physics, gave a talk on "Fourth order accurate finite volume numerics for simulating accretion disks" on 10th October 2016
- ***Prof. Vijay A. Singh,*** Raja Ramanna Fellow, Mumbai University, Mumbai, gave a talk on "The Golden Ratio, the Centre of Mass and Aesthetics" on 18th October 2016 (Colloquium #263)
- ***Dr. Yeshwant R. Waghmare,*** (Former Prof. and Dean), Indian Institute of Technology, Kanpur, gave a talk on "Is Quantum Theory the Ultimate Reality?" on 20th October 2016
- ***Prof. Vijay A. Singh,*** Raja Ramanna Fellow, Mumbai University, Mumbai, gave a talk on "Science Education: An Art or a Science?" on 21st October 2016 (Colloquium #264)

Upcoming Events

- 13th-Asia Pacific Physics Conference and 22nd Australian Institute of Physics Congress-2016, Brisbane, Australia, 4-8 December 2016 http://appc-aip2016.org.au/index.asp?IntCatId=14
- International Workshop on Radiative Properties of Hot Dense Matter, Santa Barbara, California, 5-9 December 2016 https://sites.google.com/site/rphdm2016/
- 31st National Symposium on Plasma Science & Technology (PLASMA - 2016), Bharathiyar University, Coimbatore, 6-9 December 2016 http://www.pssiplasma2016.in/
- 18th Asian Conference on Electrical Discharge (ACED 2016), IIT Madras, Chennai, India, 8-10 December 2016 http://www.ee.iitm.ac.in/ACED2016/
- 6th International Conference on Advanced Plasma Technologies (ICAPT-6) / Workshop on Industrial Application of Plasma Solutions, Siem Reap, Cambodia, 11-15 / 15-18 December 2016 http://www.plasmadis.com/wp/icapt-6/
- 26th National Seminar & International Exhibition On Non-Destructive Evaluation, Thiruvananthapuram, 15-17 December 2016 http://nde2016.com/about-nde2016.php
- National Welding Seminar (NWS 2016), Science City, Kolkata, 15-17 December 2016 http://nws2016.com/
- IAEA Technical Meeting on Uncertainty Assessment and Benchmark Experiments for Atomic and Molecular Data for Fusion Applications, IAEA Headquarters, Vienna, Austria, 19-21 December 2016 https://www-amdis.iaea.org/meetings/UQ2016/
- 7th International Symposium on Microwaves-2016 (ISM-16), NIMHANS Convention Centre, Bangalore, 19-22 December 2016 http://www.seminarindia.org/
- 25th DAE-BRNS National Laser Symposium-2016, KIIT University, Bhubaneswar, 20-23 December 2016 http://www.ila.org.in/nls25/index.php
- International Conference on Advances Computing and Intelligent Engineering (ICACIE 2016), Bhubaneswar, 21-23-December 2016 http://www.icacie.com/

Know Our Colleagues

Mr. Pankaj Kumar Srivastava joined IPR in 1997 in the Large Volume Plasma Device (LVPD) division to cater its electronics and allied engineering developments. He participated in the erection and commissioning of LVPD system and also designed, developed, and bench marked all electronics for the diagnostics and signal conditioning required for the physics explorations of this large device. He also undertook the development of special pulsed power supplies with PFN and Cap Banks. His works includes measurement and control of experimental systems involving very low temperatures like -196°C (77K) to very hot plasma temperatures similar to Sun's Chromosphere (~ 10,000°C), extreme voltages and currents ranging from few μV and μA to 10's of kVs and 10's of kA, powers from few Pico watt to 100's of kW and frequencies from 10mHz to about 25 GHz etc. He is also actively involved in India's strategic electronic technology development for strategic applications and is developing state of art systems which includes Electro-Acoustics sensor head technologies for supersonic projectile's shock-wave detection, large channel count and fast binary data acquisitions and control circuits. His other areas of interests are Avionics, Piezoelectric, FLIRs, Radars and Microwave technologies.

Ms. Pratibha Gupta joined IPR as a technical trainee in 1996 and later as an engineer in 1997 in the SST-1 RF group. Her earlier contributions for the RF group were in the design of cooling systems for LHCD and ICRH for SST-1 and design analysis of LHCD and ICRH launchers for the SST-1 and also in the design and installation of support structures for LHCD transmission line for ADITYA. Since 2008 she has been working for SST-1 magnets group contributing for the refurbishment of SST-1 by carrying out quality control of SST -1 TF, PF and TR magnets and has received appreciation for her work for the same as a team member. She is a member of IPR publication committee and the Official Language Implementation Committee and an editorial member of IPR Hindi Magazine Plasma Jyoti. She has been awarded the prestigious DAE Hindi Sevi samman in 2015 and has been topper in DAE level safety slogan competitions in Hindi and English in its 28th and 30th meets. She is involved in translation works of articles into Hindi and in the preparation of Hindi edition of IPR annual and activity reports and for the ITER Hindi newsletter also. She has brought many laurels to the institute by winning awards from various competition platforms.

The IPR Newsletter Team

Ritesh Srivastava	Tejas Parekh	Ravi A. V. Kumar	Priyanka Patel	Dharmesh P	Mohandas K.K.
Suryakant Gupta	Ramasubramanian N.	Chhaya Chavda	Shravan Kumar	Supriya N	Ritesh Sugandhi

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