Issue 8

August 2014

The Fourth State

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

From the editorial desk

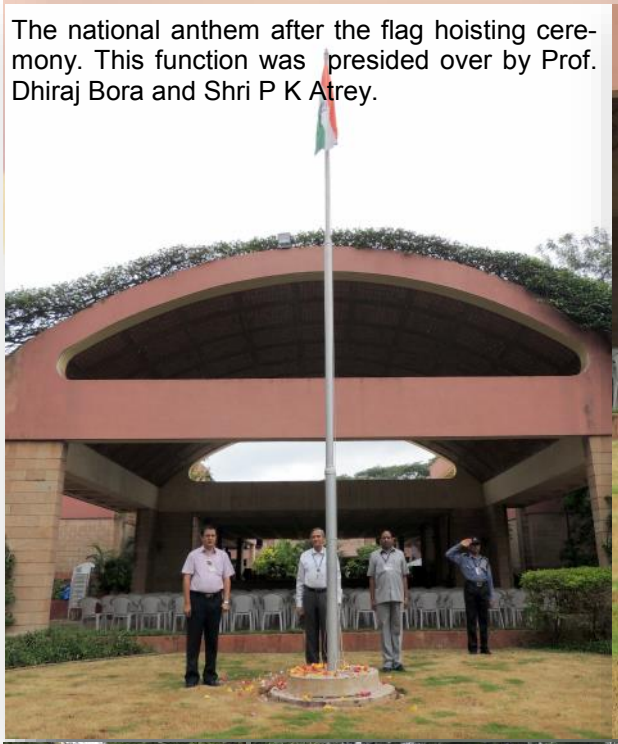
The New "Fourth State" is ONE year old !

A year has passed since the IPR newsletter was revived, and during this period, it has been a great pleasure putting together the IPR newsletter. The newsletter team has done a really wonderful job in documenting the day to day activities of IPR in the last one year. The newsletter team wishes to thank all the IPR staff members for their encouragement and support that they have given to keep this newsletter going. We hope that this encouragement and cooperation will continue for all the forthcoming issues of "The Fourth State". Please feel free to send any comment / suggestion to the committee at <newsletter@ipr.res.in> for improvement of the look and contents of the newsletter. Thank you..

Independence Day Celebrations

The 68th Independence day celebrations at IPR was kickstarted with the flag hoisting ceremony presided over by Prof. Dhiraj Bora, Director. He unfurled the national tri-colors and then addressed the gathering. In his speech, he congratulated the staff of IPR on their dedication and the excellent work carried out under various projects being handled by different divisions of IPR. He also acknowledged and thanked the support staff of IPR without whose support it would not have been possible to achieve all this success. He further mentioned that all IPR'ites should actively participate in the DAE Jubilee celebration activities that are being planned by IPR during the coming year. Tricoloured balloons were then released by the children of staff members. The flag hoisting was followed by tea and snacks. Further, the IPR Staff Club organized various activities for the staff and their family. Activities included fancy dress , singing/dancing, and *antakshari* competitions.

The national anthem after the flag hoisting ceremony. This function was presided over by Prof. Dhiraj Bora and Shri P K Atrey.



Director, IPR addressing the gathering.

Releasing of the tri-colored balloons by children of IPR staff.

View of the members present for the flag hoisting ceremony

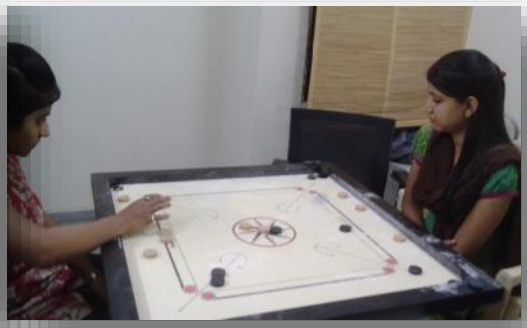
IPR Sports Events

IPR Staff club organized various game events viz– Chess, table tennis, carrom since July 7, 2014 to encourage and motivate employees. The participation from the employees have been overwhelming and resulted in tough completion even to the defending champions. Awards to the winners and runner-ups will be given during Independence Day celebrations.

No.	SPORTS	WINNER	RUNNER-UP
1	Chess (Men)	K.P. Singh	Urmil Thaker
2	Chess (Women)	Sapna Mishra	Swati Roy
3	Carrom (Men's Single)	Piyush Raj	Lavkesh Lacchavani
4	Carrom (Women's Single)	Moni Banaudha	Sapna Mishra
5	Carrom (Men's Double)	Mahesh Ghate & Shailesh Kanpara	Kartik Mohan & Ronak Shah
6	Carrom (Women's Double)	Moni Banaudha & Chesta Parmar	Akansha Gupta & Sapna Mishra
7	Carrom (Mixed Double)	Piyush Raj & Swati Roy	Nitin Bairagi & Saifali Dalakoti
8	Table Tennis (Men's Single)	Arvind Kumar	Aditya Prakash Singh
9	Table Tennis (Women's Single)	Surabhi Jaiswal	Swati Roy
10	Table Tennis (Men's Double)	Arvind Kumar & Deepak Aggarwal	Deepak Mandge & Avik Bhattacharya
11	Table Tennis (Women's Double)	Surabhi jaiswal & Bhumika Thakur	Swati Roy & Saifali Dalakoti
12	Table Tennis (Mixed Double)	Deepak Aggrawal & Surabhi Jaiswal	Deepak Yadav & Saifali Dalakoti

Chess singles match in progress

Finalist of TT mixed doubles



Women's carrom match being played

Men's carrom match being played

Men's TT match being played

Silver Stars of IPR

Mr. Vinod D Kaila joined the Mechanical Engineering workshop in 1987. His contribution is showcased as many a precision machined components and systems at different labs of the institute.

Dr. Lalit M. Awasthi joined IPR in 1987.He was first involved in diagnostics in ADITYA tokomak and later on moved on to the basic experiments and was involved in commissioning the LVPD system. Presently he heads the LVPD group.

Mr. Umesh N Savai : Ever since he joined IPR in 1988, he was in charge of disbursal of cash as TA, DA and the imprest fund and also took care of the scrutiny of the related ledgers and documents.

Computation Facilities @ CPP-IPR

Theory and Simulation Laboratory (TSL) of CPP-IPR conducts research in both basic plasma physics areas and applied concepts of plasma physics.

Major Hardware Facilities at TSL Laboratory: The laboratory has two Linux (Fedora Core) clusters.

- The first cluster has 24 nodes with Intel core – i5 quad core based HP – Z200 workstations with 8GB RAM and 250 GB HDD each. The server node is a HP server with 02 nos. hexa-core Xenon W5670 processors, 32 GB RAM and 5 TB HDD.
- The second cluster has one dual-processor DELL precision 690 workstation with 1.5 TB HDD and 32 GB RAM and 12 Nos. of new assembled nodes, each consisting of hexa-core AMD Phenom – II X6 1055/1090 T processors along with 8 GB RAM and 512 GB HDD each.

The 24-node cluster at TSL, CPP

Major Software Facilities at TSL Laboratory:

Besides the usual software/ compilers etc. coming free with Linux, the lab has acquired MATLAB 2010b with parallel computing toolbox and distributed computing server for parallel code development in MATLAB environment. In addition a CAD software, namely SolidWorks, and deterministic particle transport code ATTILA has also been acquired.

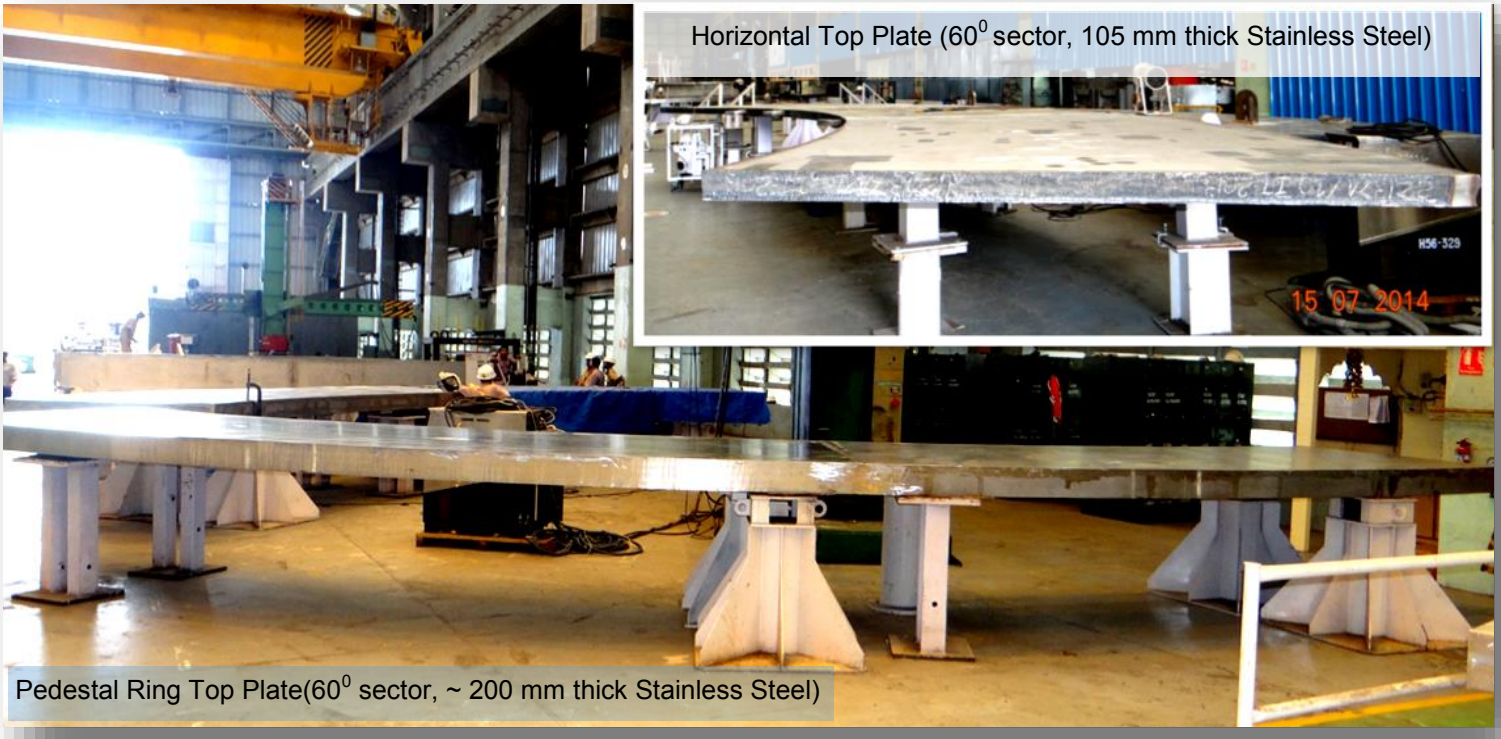
The main areas of work of the laboratory include :

- Neutronics Modelling.
- PIC Simulation of Negative Ion extraction.
- Modelling on Complex Plasmas.
- Study of Plasma Wall Transition near Divertor region for different divertor materials.
- Interaction of Dust Acoustic Waves with dust void and their stability analysis.

ITER-India

Manufacturing activities for ITER Cryostat are progressing well at Larsen & Toubro Heavy Engineering facility in Hazira. Featured above are the fabrication progress on Pedestal Ring Top Plate (~200 mm thick) and Horizontal Top Plate (105 mm thick) which are parts of the Base section of Cryostat.

The ITER Cryostat will be manufactured in 54 modules at Hazira, which will then be transported to the Cryostat workshop at ITER site, France where it will be further fabricated into 4 main sections (Base section, Lower Cylinder, Upper Cylinder, Top Lid) for final assembly in the ITER Tokamak Pit.



Horizontal Top Plate (60^0 sector, 105 mm thick Stainless Steel)

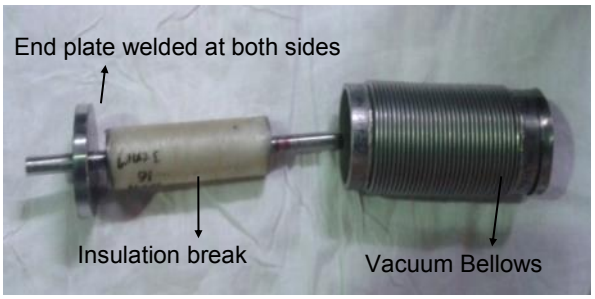
Pedestal Ring Top Plate(60^0 sector, ~ 200 mm thick Stainless Steel)

Performance Tests on Indigenous Developed Electrical Insulation Breaks

Electrical insulation breaks for superconducting fusion machine has been developed successfully with R & D collaborator (M/s Uniglass industries Ltd, Bangalore) under National Fusion Programme. Mechanical loading as well as Paschen tight design of developed electrical breaks found to be satisfactory and within the technical specification as defined by IPR. The helium leak rate <1.0x10-08 mbar-l/s achieved in developed insulation breaks under mechanical loading condition at 77 K, 4.2 K similar to ITER test condition, these developed insulation breaks can be used for future indigenous superconducting fusion magnet, electrical isolation and for low temperature purpose (up to 12 kV applications).

Mechanical and Electrical Performance Tests @ 300, 77 K

- 2000 N in traction and compression load (applied load: 0-400 Kg)
- 100 N-m bending performance test (0- 301.8 Kg)
- 100 N-m torsion performance test (0-102 Kg)
- Helium leak rate @ 20 bar helium pressure and 4.2 K temperature
- High voltage electrical test at DC (0-5kV) and (0 30 kV) in air
- Average Helium leak rate observed: <1.0x 10^{-08} mbar-l/s in test helium pressure: 0-20 bar



Testing of High Pressure safety Valves of Cryogenic Distribution System of SST-1

The high-pressure safety valves, which are the integral parts of integrated flow distribution and control (IFDC) system at SST-1 cryogenic facility. There are four safety valves installed in the inlet and outlet cryogenic transfer lines hydraulically connected to TF and PF superconducting magnets of SST-1. The function of these valves is to release the helium gas during the quench of SCMS at 15-bar pressure and transfer helium gas to either quench recovery tank or high-pressure tanks. As a part of preventive maintenance activity of cryogenic plant for next plasma experiment campaign, we have carried out the high pressure tests on theses safety valves at indigenous developed test set up at MEL cryogenic lab.

Integrated flow distribution circuit of the HRL plant


Internal components of safety valve

Salient Features:

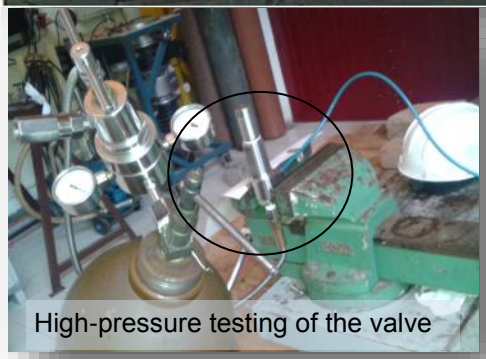
The safety valves were disassembled from the cryogenic distribution systems after about 12 years, it was really challenging job to take out these safety valves from assembly.

The test set up has been developed and assembled considering the high-pressure threaded connections standard DIN ISO 228-1of ½" x ½" and 1"x1 ½" sizes safety valves.

The safety valves set pressure has been adjusted up to the required set pressure by tightening the nut varying the spring constant.

The desired set pressure and closed sealing pressure were achieved 12.5 bar (g), 10 bar (g) and 13 bar (g) and 11 bar (g) in ½" safety valves and 10 bar (g) and 9 bar (g) in both 1" valves respectively.

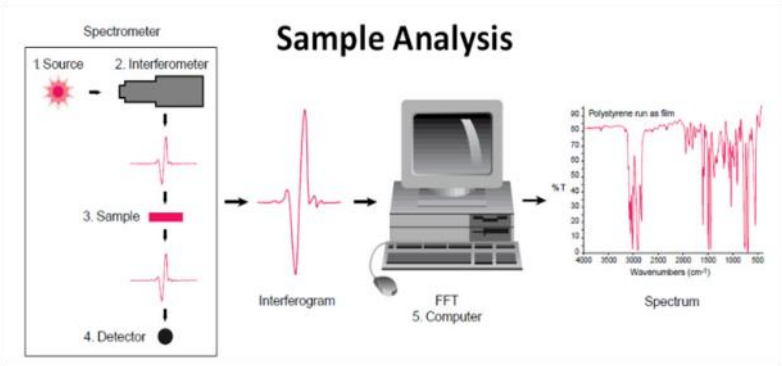
Followed the safety valve test and sealing standards API 257 and API 527. Cryogenic crews have performed the high-pressure test of safety valves.


High-pressure testing of the valve

Fourier Transform Infrared Spectroscopy (FT-IR) at FCIPT

Nicolet 6700 FTIR spectrometer

Infrared spectroscopy (IR spectroscopy) is the subset of spectroscopy that deals with the infrared region of the electromagnetic spectrum. It can be used to identify compounds or investigate sample composition. FCIPT has Nicolet 6700 FTIR Instrument in its lab.

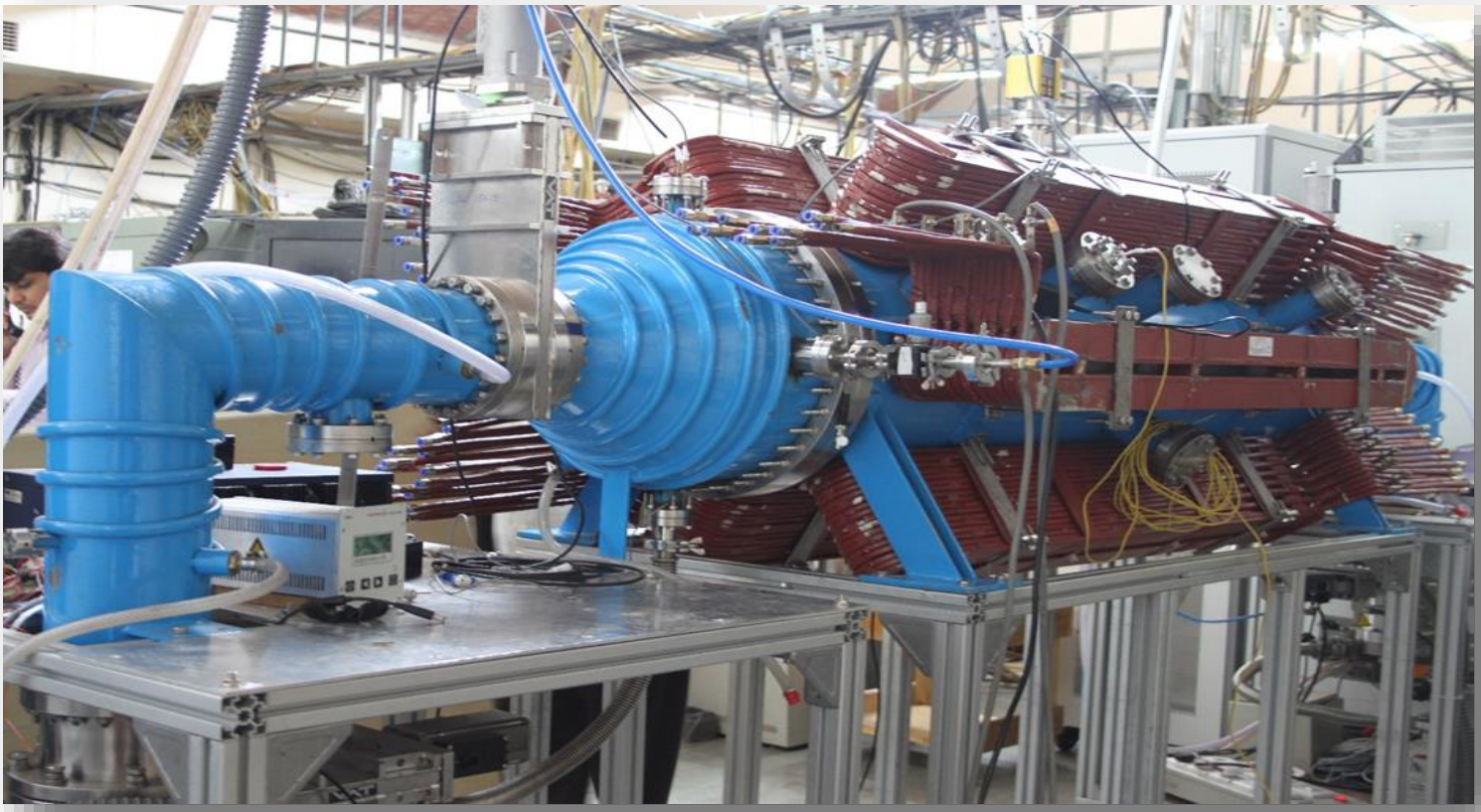


Features:
Transmission, ATR (Attenuated Total Reflection) and Specular Reflectance ATR Crystal – ZnSe
For more details please refer IPR/TR-291/2014 (JUNE 2014)

Sample Preparation:
Soft polymers, rubbers, soft powders and surface coatings can be tested.

Applications:
This instrument can be used for analysing surface and bulk chemical properties of the material which can be useful for divisions like Divertor and First Wall Technology Development, TBM, Magnets, Fusion Reactor Materials Development and Characterization etc.

Multi-Cusp Plasma Device at IPR



Basic aim: To confine contact ionized (tungsten surface) cesium ions in a multi-line cusp magnetic field and do its characterization.

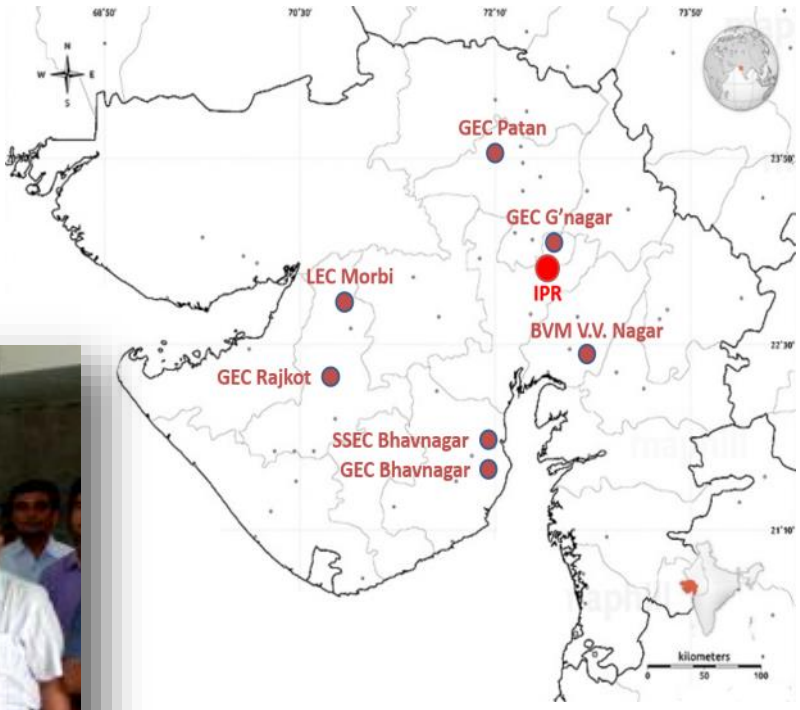
Expected Result: A 'text book' like ideal plasma, with Te~Ti, really quiescent, with only 'natural' fluctuations.

Experiments planned: Identify the real thermo-dynamic fluctuations and its sources; now perturb the plasma with energy and particles and study the linear/non-linear evolving phenomena.

Status: Magnets have been integrated; field mapping (and hence alignment) is in progress; hot-plate ionizer (indirectly heated Tungsten plate) is in final stage of fabrication; delivery pipes for the cesium oven is getting ready; plasma expected by end of this year.

State Project Facilitation Unit (SPFU) Meeting @ IPR

An MoU was signed between IPR and Commissionerate of Technical Education, Govt. of Gujarat in January 2014 to enhance and strengthen the research standards & activities of state engineering colleges of Gujarat under TEQIP-II programme. Under this MoU, a meeting was held on 12th June 2014 at IPR, for presentation of potential PhD problems related to Plasma Physics for the benefit of PhD candidates from various colleges and disciplines (Mechanical, Electronics, Instrumentation and Chemical) of engineering under Gujarat technical University (GTU).



Prof. D Bora, Director, IPR with Dr. Jayanti Ravi, Commissioner, Higher Education, Government of Gujarat and other delegates of the SPFU meeting.

Video Conferencing Systems @ At All IPR Campuses

All the campuses of IPR, *viz*, IPR main campus, FCIPT and IPR New labs (at Gandhinagar) as well as CPP-IPR campus in Guwahati have now been connected by state-of-the-art LifeSize Video Conferencing (VC) systems. CPP-IPR campus is also now connected to the internet through a 10 Mbps optical fiber line for faster internet access. Implementation of this system will improve remote communication between the various campuses of IPR.

The details of the VC systems are as follows. Staff may use this facility to communicate with the other campuses. Details are available on the intranet website http://cc.ipr.res.in/cc/home/vc.html

Users may contact the Computer center of IPR for any help regarding usage of this facility.

Location of the VC unit	Name of the VC unit	Video Number (ITER-IO Gatekeeper)	Public IP
IPR VC Room	IN-ITER-INDB	0442665839	210.212.122.211
IPR Director's room	IN-VC-IPR-Director	0442665834	210.212.122.212
IPR Board Room	IN-VC-IPR-Board-Room	0442665847	210.212.122.215
IPR Committee Room 1 (New)	IN-VC-IPR-Committee-1	0442665848	210.212.122.216
IPR Committee Room 2 (New)	IN-VC-IPR-Committee-2	0442665849	210.212.122.217
IPR Extension Labs (Gandhinagar)	IN-VC-IPR-LAB	0442665833	210.212.138.5
FCIPT (Gandhinagar)	IN-VC-IPR-FCIPT	0442665830	210.212.137.245
CPP-IPR (Guwahati)	CPP-IPR	Not registered	210.212.8.18

Welcome To The New PhD Scholars !

On behalf of IPR, the newsletter wishes to welcome all the new PhD scholars who joined IPR from 1st August 2014. We welcome them to the IPR family and we hope that your next few years at IPR will be the best years of your life. We wish you all the best in your career !


Rupak Mukherjee


Avnish Kumar Pandey


Shivam Kumar Mishra


Tirthendu Sinha

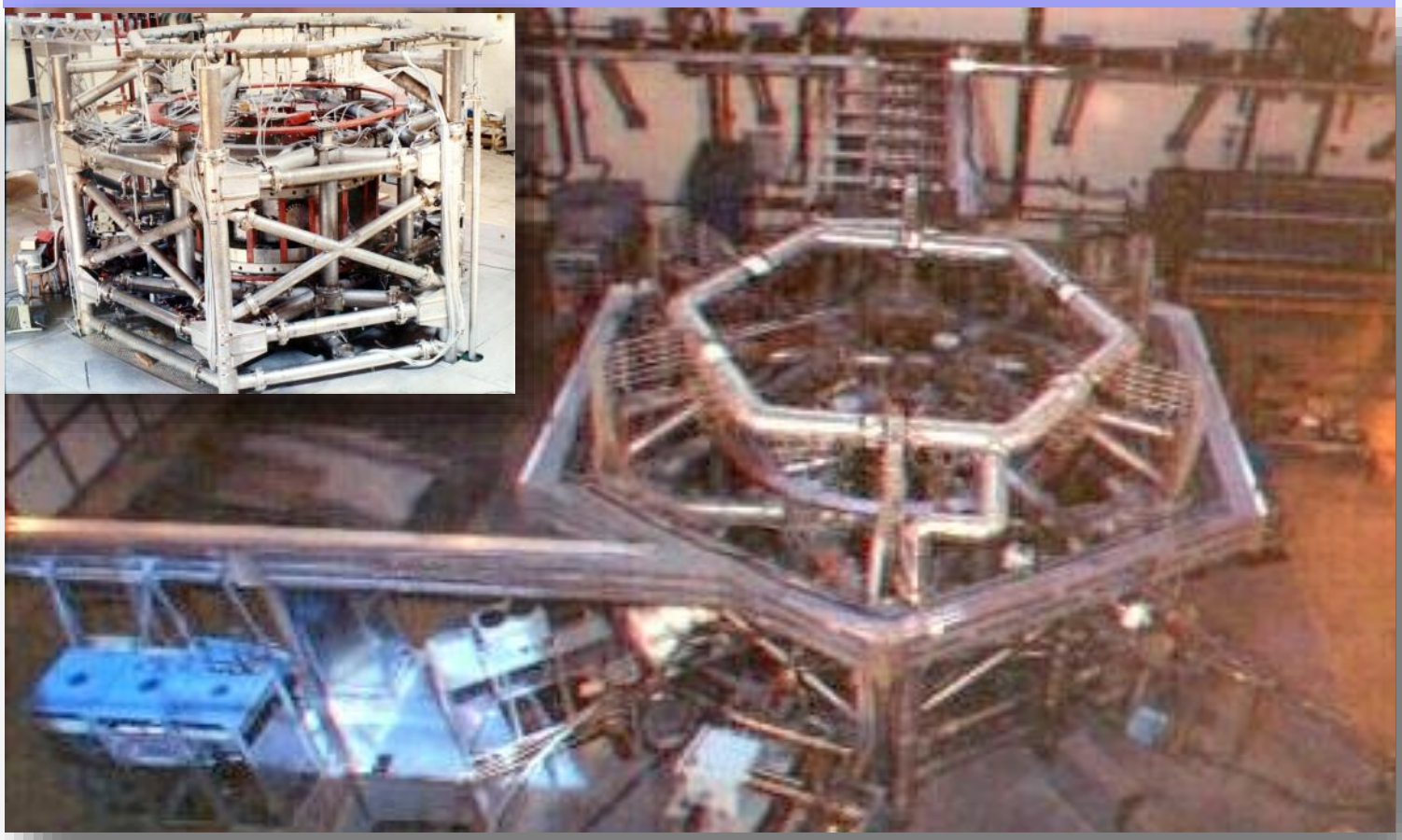
Past Events @ IPR

- **Mr. Gattu Ramesh Babu**, IPR, gave a talk on "*How to File Income Tax Return*" on 17th July 2014
- **Dr. Debabrata Banerjee**, Saha Institute of Nuclear Physics, Kolkata gave a talk on "*Effect of non-Newtonian behaviour on low frequency wave and instability in dusty plasma*" on 18th July 2014
- **Dr. Rajiv Goswami**, IPR, gave a talk on "*Core-SOL coupling in tokamaks*" on 24th July 2014
- **Prof. Chin-Kun Hu**, Institute of Physics of Academia Sinica, Taipei, Taiwan, gave a talk on "*Universality and scaling in physical, biological, and social systems*" on 31st July 2014
- **Mr. A. K. Sahu**, IPR, gave a talk on "*Magnet Feeder Systems for tokamak ITER*" on 1st August 2014
- **Prof. Mohammed Shahabuddin**, Department of Physics and Astronomy, College of Science, King Saud University, Riyadh, Saudia Arabia, gave a talk on "*MgB2 superconducting wire: Prospect for low field application especially in MRI*" on 4th August 2014
- **Mr. Haresh Dave**, IPR, gave a talk on "*I & C Standardization and Plant Control Design Handbook for ITER project*" on 4th August 2014
- **Prof. Bruce T. Tsurutani**, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, gave a talk on "*Nonlinear Wave/Structure-Particle Interactions*" (Colloquium #234) on 7th August 2014
- **Mr. Ashok D. Mankani,** IPR, gave a talk on "*Design and Development of large AC power systems and DC power electronics systems*" on 8th August 2014
- **Mr. Dinesh Gupta**, IPR, gave a talk on "*Conceptual Design of Secondary Cooling Water system for ITER*" on 11th August 2014
- **Mr. H. K. Gulati**, IPR, gave a talk on "*CODAC, CIS and CSS infrastructures for ITER*" on 14th August 2014

Upcoming Events

- 12th Asia Pacific Conference on Plasma Science and Technology (APCPST) and 27th Symposium on Plasma Science for Materials (SPSM), Adelaide, Australia, 31 August-5 September 2014 http://www.unisa.edu.au/apcpst
- 5th Euro-Asian Pulsed Power Conference (EAPPC 2014), Kumamoto, Japan, 8-12 September 2014 http://www.ipps.kumamoto-u.ac.jp/eappc2014/index.html
- 13th International Workshop on the Fast Ignition of Fusion Targets, Oxford, United Kingdom, 14-18 September 2014 http://fi2014.iope-confs.co.uk/home
- International Conference and School on Plasma Physics and Controlled Fusion and Adjoint Workshop "Nano- and Micro - Sized Structures in Plasmas", Kharkov, Ukraine, 15-18 September 2014 http://www.kipt.kharkov.ua/ipp/ipp/192.168.210.27/ipp/alushta2014/index.htm
- 14th International Conference on Plasma Surface Engineering, Garmisch-Partenkirchen, Germany, 15-19 September 2014 http://www.pse-conferences.net/pse2014.html
- 17th International Congress on Plasma Physics (ICPP 2014), Lisbon, Portugal, 15-19 September 2014 http://www.ipfn.ist.utl.pt/ICPP2014/Welcome_to_ICPP_2014.html
- Quantum, Atomic, Molecular and Plasma Physics (QuAMP) Summer School, Durham, DH1 3LE, United Kingdom, 15-19 September 2014 http://quamp2014.iopconfs.org/home
- 9th International Conference on Atomic and Molecular Data and Their Applications (ICAMDATA), Jena, Germany, 21-25 September 2014 http://www.icamdata.uni-jena.de/
- 14th International Symposium on High Pressure Low Temperature Plasma Chemistry (HAKONE XIV), Zinnowitz, Germany, 21-26 September 2014 http://www.hakone2014.org/
- International Conference on Plasma Science and Applications (ICPSA 2014), Dhulikhel, Nepal, 22 - 24 September 2014 http://ku.edu.np/icpsa-2014/
- International Conference on Dark Matter, Hadron Physics and Fusion Physics, Messina, Italy, 24-26 September 2014 http://newcleo.unime.it/Events/DHF2014/index.html
- International Symposia on Discharges and Electrical Insulation in Vacuum (ISDEIV), Nehru Centre, Worli, Mumbai, India, 28 September-03 October 2014 http://www.ivsnet.org/isdeiv/ISDEIV-2014/
- 28th Symposium on Fusion Technology (SOFT 2014), San Sebastian, Spain, 29 September-3 October 2014 http://www.soft2014.eu/

When nature flexed its muscles - The heavy rains of 30th July uprooted a big *neem* tree near the porch of IPR main building.



View of the Aditya Tokamak during its installation in 1987-88 (Inset: Aditya machine before auxiliary systems were assembled)

The IPR Newsletter Team

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