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Year 2013
Issue 2
September

The Fourth State

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

From the editorial desk

The editorial committee of the IPR newsletter wishes to thank all the IPR staff members for their encouragement and support that they have given to the revived newsletter. We hope that this 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..

67th Independence Day Celebrations

The 67th independence day of India was celebrated at IPR on 15th August 2013. The Director, IPR set off the celebrations by hoisting the national tri-color at 09:30 am. This was followed by release of the rejuvenated IPR newsletter "The Fourth State". The flag hoisting ceremony was followed by a high tea and several activities for children of the staff members. More than 300 people attended the function. Many activities including a painting competition for the children of staff members, "Antakshari" ranged as part of the 67th I-Day celebration for the children of IPR staff members of India and a motivation talk by Dr. healthy modern living was also or-



Prof. Bora & P K Atrey releasing the IPR newsletter



for the staff members etc. were arranged. A fancy dress programme for the children of IPR staff members on the theme of freedom fighters A. K. Srivastava on the concept of organized.



The Flag hoisting ceremony



Fancy dress program by children of IPR Staff members

The IPR staff members took active part in the "Antakshari competition" and soon the auditorium was alive with a string of melodies from yesteryears and patriotic songs!! The competition between the ladies' and gents' teams were also joined by the audience to make it a very memorable programme.



The Antakshari competition hots up !!



The audience enjoying the programme



Motivation talk by A. K. Srivastava



Anushka Kundu



Chill.. I have this under control !!



Working hard !!



Krishnapriya Mohandas



The painting competition



Artist's block ?

Children's painting competition for the age group 8-15 years was conducted as part of the I-Day celebrations and the theme was, YES. Independence day !! :-). Amongst the 20 odd participants, Ms. Anushka Kundu (D/o Dr. Mritunjay Kundu) won the 1st price for her artistic rendering of the Quit India Movement. The 2nd prize was bagged by Ms. Maiolica Bandopadhyay (D/o Mr. Mainak Bandyopadhyay) for her painting on religious harmony and the 3rd prize was bagged by Ms. Krishnapriya Mohandas (D/o Mr. K. K. Mohandas) for her colourful rendering of the Indian tricolor jet trails., each with a message for a better India. Congratulations to all the budding artists ! In the age group 4 – 7 years, Sumedha (D/o Mr. Upendra Prasad), Manya (D/o Ms. Pramila Gautam) & Tithi won prizes.

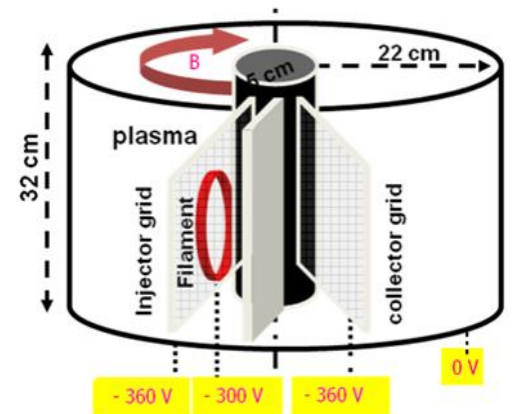


Maiolica Bandopadhyay

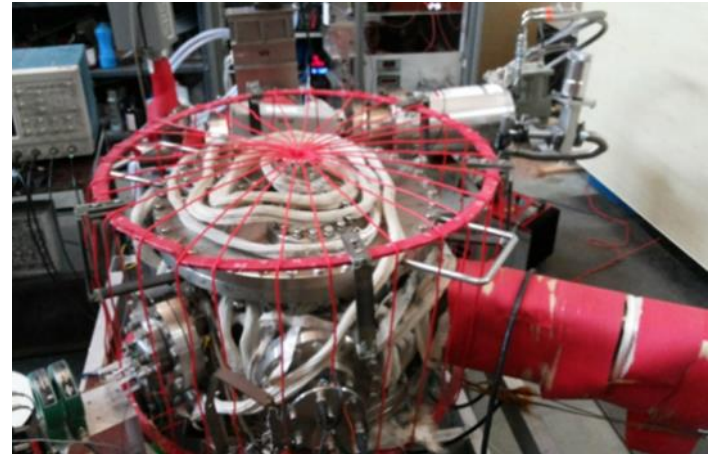


Conventional plasma, by definition, is a quasi-neutral collection of mutually interacting electrons and ions having a collective effect. In contrast, there is an exotic world of plasmas, which are “non-neutral” having only one species. Pure electron plasmas are perhaps the most popular, although ion plasmas, positron plasmas and anti-proton plasmas are also possible. They are called plasmas because they too exhibit rich collective phenomena.

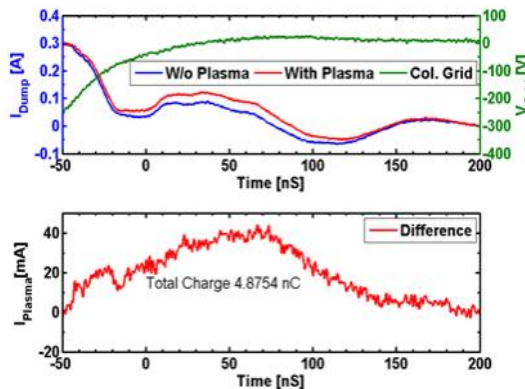
A **SM**all **A**spect **R**atio **T**oroidal **E**xperiment (SMARTEX) is being carried out in IPR in a trap that mimics the *inject-hold-dump* mechanism of cylindrical traps in a toroidal geometry. The trap has modified the toroidally continuous device into a C-shape.



ID	2.5 cm
OD	22 cm
Aspect ratio	1.6
Height	32 cm
Vacuum	10^{-9} Torr
2 nd wall dia.	5 cm



SMARTEX-C with toroidal field coils



Charge collection signals and the toroidal field and the difference between collector signals with and without plasma shots.

Salient features

- Traps electrons to form pure electron plasma in a Toroidal “Penning like” trap in the toroidal magnetic field of about 200 Gauss.
- Studies: Ion resonance instability, Resistive wall destabilization, Vortices formation and Kelvin-Helmholtz instability
- Diagnostics: Charge collector diagnostics, Capacitive probe diagnostics and Imaging diagnostics (Proposed).
- Contact - Manu Bajpai

IPR Summer School Programme - 2013

Total students	49
Physics students	26
BE/B.Tech students	23
Local students	16
Outstation students	33

- To promote and popularize Plasma Physics among students, the Institute for Plasma Research (IPR) has been organizing Summer School Program every year in the month of June-July, since last two decades.
- Under this program every year the students pursuing their M.Sc. as well as B.E/B.Tech from all over India are selected. It is a six week long program which includes lectures as well as hands on experiments.
- This year Summer school program was conducted from 3rd June 2013 to 12th July 2013
- The programme consisted of lectures, popular lectures by eminent scientists and project

- The students spent time in the various laboratories of IPR doing hands-on experiments.
- Students made an open presentation based on their project work at the end of the programme.
- As part of the activities, the students were taken on a visit to the Science City as well as Space Application Centre-ISRO.
- A picnic to the Polo Forests in Himmatnagar was also organized for the Summer School students.



High Heat Flux Test Facility (HHFTF) is being established at IPR Extension Lab for testing thermal performance of plasma facing materials and components using Electron beam as a heat source. The Vacuum Chamber and Target Handling System (THS) is one of the major subsystems of HHFTF. Electron Beam Gun, Vacuum Pumping System and Diagnostic Equipment are mounted on Vacuum Chamber. Targets (i.e. test mock-ups or components) to be tested for their thermal performance are assembled on THS and integrated with the coolant water supply piping network. Large sized targets weighing up to 1000kg (including fixtures) can be assembled on the THS.



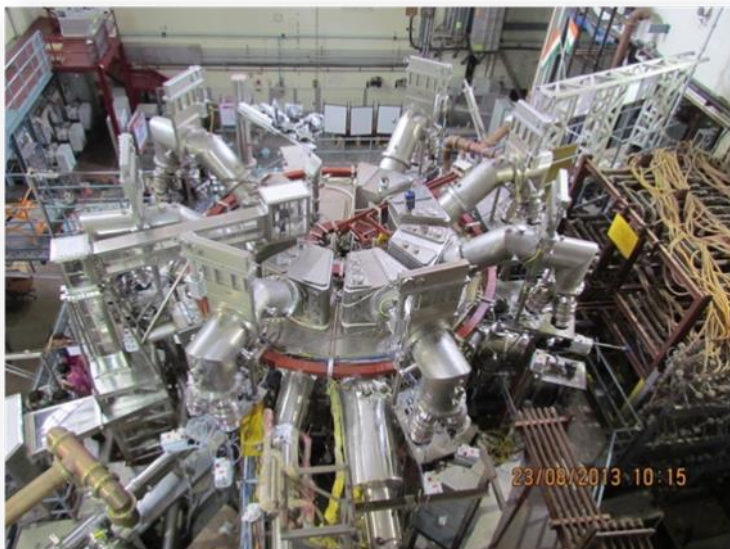
HIGHLIGHTS

- Installed, tested and commissioned at Divertor Lab-4 (Vidhata Campus) on 19 Aug 2013.
- D-shaped Double walled water cooled chamber vacuum chamber of size 3.2m x 2.7m x 1.7m and volume of 5m³.
- Target handling facility with trolley on railing system to facilitate assembly – integration and pre-testing of the target component away from vacuum chamber.
- Various ports to mount Plasma Facing Components (PFCs), Electron Beam (EB) gun, Diagnostic instruments, Vacuum Pumps etc.
- Materials: SS 304L chamber, CuCrZr shielding plate and CuCrZr blocks.
- Main pumping system: Turbo Molecular Pump -2000l/s, Cryopump -3000l/s.
- Ultimate vacuum achieved with TMP during testing: 2.7×10^{-6} Torr.

— Divertor Group

SST-1 News

The SST-1 device is currently being readied for Campaign-V and the physics experiments on the machine are scheduled to begin by 16th September and last for two weeks. In anticipation of the oncoming campaign, work regarding maintenance of the system as well as implementing of additional pumping ducts, overhauling of the helium liquefaction plant, inspection of all RF appendages *etc.* were initiated and completed. The cooling down process of the machine is currently underway.



TOP view



SST-1 equipped with the divertor pumping system

SIDE view

In the campaign-V, SST-1 envisages to achieve the following goals ;

- operating the superconducting Toroidal Field Magnets in excess of 10000 s at 1.5 T.
- Breaking down the plasma assisted with ECRH in fundamental mode O.
- Operating the machine with slightly increased loop voltages up to 2.5 V.
- Coupling the ohmic regime with that of the LHCD take over.

SST-1 Data Access Utility is now available to users. For details, log on to

http://202.41.113.168/content/?q=sst_storage

(http://sst1web/content/?q=sst_storage)

For any assistance regarding this, please contact Mr. Harish Masand <harish@ipr.res.in>.

Cryo-lines Test Facility at IPR

- ◆ A state-of-the-art test facility with unique features to validate the design parameters of ITER cryo-lines is getting its final touches at ITER-India laboratory in IPR premises.
- ◆ Cryo-lines are special arrangements of vacuum insulated pipes which transfer cryogenic fluids, namely Helium, Nitrogen etc. at very low temperature ($\leq -196^{\circ}\text{C}$) from one system to the other system.
- ◆ Cryolines for the ITER project do not adhere strictly to the simple definition given above although basic function remains the same. ITER cryo-lines will be one of its kinds of network of most complicated cryo-lines in reality, when installed at ITER site at Cadarache.
- ◆ The ITER-India test facility will have following unique characteristics:
 - Helium at 80 K, 35 gm/sec, 6.5 bar
 - Liquid Nitrogen Storage (5500 Litres) and distribution at 2 bar
 - Liquid Helium (5000 Litres storage) at 4.5 K, 8 gm/sec, 1.3 bar capable of providing stable flow up to 10 K.
 - A distribution system with specialized test boxes to control the experiment
 - A control system as per ITER project configuration.
- ◆ The facility is unique in the sense that it provides opportunity for measurement of very accurate cryogenic process parameters such as temperature, pressure, mass flow rate, stresses etc. The architecture of this facility is well planned and with a perceptively designed control system, which is a necessary requirement for the experiments to be conducted. The facility will be ready for operation by November, 2013.



Safety Training

A first-aid and fire fighting demonstration / training was organized by the Safety Committee at IPR. Selected employees were given training in providing first aid, CPR (Cardio-Pulmonary Resuscitation) and proper use of fire extinguishers.

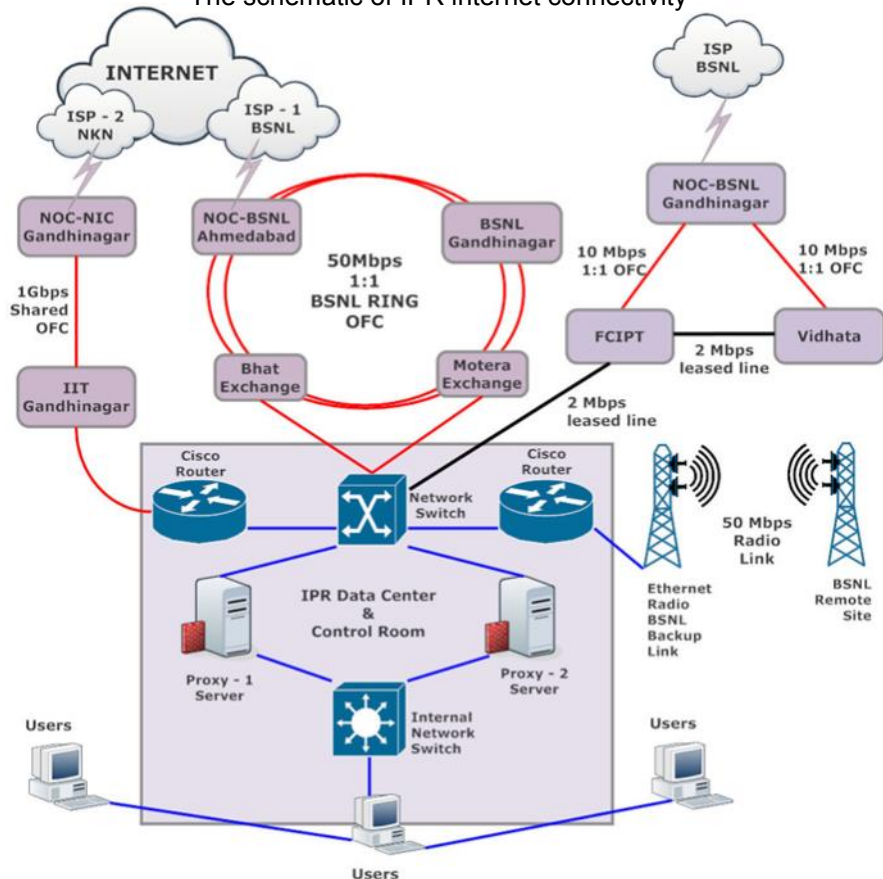


Learning to use the fire extinguisher



Learning the CPR technique

The schematic of IPR internet connectivity



IPR has recently switched from a private ISP (Internet Service Provider) to BSNL. The following are the salient points of IPR's Internet Service ;

- 50 Mbps 1:1 bandwidth connectivity for IPR and 10Mbps 1:1 bandwidth for FCIPT and Vidhata campuses.
- Optical Fiber Cable (OFC) in ring structure for redundancy in connectivity for IPR and single OFC for FCIPT and Vidhata Campuses.
- BSNL connectivity is backed up with high speed 50Mbps radio link for second level of redundancy (to be implemented).
- Backup ISP services are from National Knowledge Network (NKN) providing 1Gbps (shared) on single OFC. This provides a third level of ISP redundancy.
- 10Mbps 1:1 bandwidth over single OFC to IPR-CPP, Guwahati to be implemented along with video conferencing facility.

For any issues related to internet connectivity, please contact cc@ipr.res.in

Board of Research in Fusion Science & Technology (BRFST)



BRFST was conceived in 2007 with the mandate to build India's indigenous capabilities as well as trained manpower in the varied and technologically challenging areas of fusion science & technology so as to achieve India's own fusion plans. Since then, BRFST has funded more than 100 projects with a total funding of over **Rs. 25 Crores** to academic as well as industrial collaborators, developed technologies that were directly relevant to the fusion programme, trained over 100 interns, supported over 50 conferences and organized several meetings to popularize plasma & fusion science & technology all over India.

- In its six years of existence, BRFST has gained immense popularity amongst collaborators all over India due to its easy, transparent, flexible and quick-response style of functioning.
- R&D projects related to Fusion Science & Technology and Plasma Science & Technology up to a total budget of **Rs.50 Lakhs** can be accepted, reviewed and funded by the Board. For projects above 50 Lakhs, final financial approval will however, have to be given by the BRNS, DAE.
- Project SHOULD have a coordinator from IPR.
- Projects can be submitted any time, but review will be held only twice a year, i.e., in March and August.
- Collaborator can be any permanent faculty in any of India's academic or R&D institutions except those under DAE. Industry collaborators however, must satisfy DST norms.
- Funding of conferences, meetings, workshops in the areas of Plasma & Fusion Science & Technology.
- Internships to masters students in science & technology to carry out their project work.
- Travel funding to project staff (who have registered for PhD) to attend conferences abroad.

IPR staff are requested to make full use of this opportunity to forge new collaborations with Academic / Research institutions and even with Industry partners in achieving R&D goals related to fusion science & technology requirements of India's own fusion programme.

For details regarding project submission, please refer to the website www.nfp.pssi.in and the extensive FAQ therein or contact the BRFST Coordinator Dr. Ravi A. V. Kumar (2181)

Our scientific power has outrun our spiritual power. We have guided missiles and misguided men - Martin Luther King, Jr.

Congratulations !!

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Dr. Tejen Kumar Basu

The Department of Official Language, Ministry of Home Affairs, Government of India has instituted from 1986-87 an cash award scheme "**Indira Gandhi Rajbhasha Purashkar**" for writing original books in Hindi language. This scheme is meant for employees either working or retired in various Ministries / Departments, Banks and Financial Institutions, Public Sector Undertakings.

Dr. Tejen Kumar Basu, Raja Ramanna Fellow of DAE working in IPR has been selected for one of these awards for the year 2011-12. The award presentation function will be held at the Plenary Hall, Vigyan Bhavan, New Delhi on 14 September 2013 and the Honorable President of India, Shri. Pranab Mukherjee will give away the awards.

On behalf of all the IPR staff members, we wish to congratulate Dr. Basu on his unique achievement.

Adieu



Shri B. N. Buch retired as a Scientist-SG on 31st August, 2013 after completing 27 years of service in IPR. He joined in August 1986 as Engineer SC. We wish him good health and a happy retired life.

The trouble with retirement is that you never get a day off - Abe Lemons



Thesis Submission

Mr. Kshitish Kumar Barada submitted his thesis entitled "*Study of wave propagation and potential structures in an expanding helicon plasma*" on 31-August, 2013. His thesis advisor is **Dr. Prabal Chattopadhyay**.



Mr. Sushil Kumar Singh submitted his thesis entitled "*Study Observation and Theory of Electron Temperature Gradient Turbulence in Laboratory Plasma*" on 2-September, 2013. His thesis advisor is **Prof. Raghavendra Singh**.

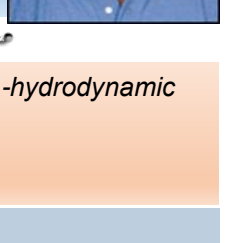


Mr. Deepak Sangwan submitted his thesis entitled "*Study Studies of plasma Flows in Scrape-off Layer Plasma of ADITYA Tokamak*" on 29-August, 2013. His thesis advisor is **Prof. Ratneshwar Jha**.



Mr. Sanat Kumar Tiwari submitted his thesis entitled "*Study of dusty plasmas using Generalized Hydrodynamic Model (GHD)*" on 16-August, 2013. His thesis advisor is **Prof. Amita Das**.

Mr. Vikram Sagar submitted his thesis entitled "*Laser Drive Acceleration of Charge Particle in Vacuum*" on 25-July, 2013. His thesis advisor is **Prof. P. K. Kaw**.



Mr. Gurudatt Gaur submitted his thesis entitled "*Study of Shear Driven Electron Magneto-hydrodynamic (EMHD)*" on 25-July, 2013. His thesis advisor is **Prof. Amita Das**

We wish them good luck in all their future endeavours.

- **Dr. D. V. Senthilkumar**, Transdisciplinary Concepts and Methods, Potsdam Institute for Climate Impact Research, Telegraphenberg A 31, Postfach 60 12 03, D-14412 Potsdam, Germany, gave a talk on "*Delay effects on the collective behaviors of a network of nonlinear oscillators*" on 6th August, 2013.
- **Dr. Mohammed Shahabuddin**, Department of Physics and Astronomy, College of Science, Saudia Arabia, gave a talk on "*MgB2 superconducting wire: Present status and its future prospects*" on 13th August, 2013.
- **Prof. E. Krishnakumar**, Tata Institute of Fundamental Research, Mumbai, gave a talk on "*Negative ion formation from molecular hydrogen by electron collision*" on 26th August 2013.
- **Dr. Raj Singh**, Department of Physics, Banaras Hindu University, gave a talk on "*Fragmentation dynamics of atmospheric molecules under the impact of keV electrons*" on 27th August 2013.
- **Topical Conference on Atomic Processes in Plasmas** (ISAMP-TC-2013), 18-20 November 2013 - <http://www.ipr.res.in/TC2013/>
- **Nanoscale Excitations in Emergent Materials** (NEEM 2013) 25-26 November 2013. - <http://www.plasmaindia.com/neem2013.html>



National Symposium on High Power RF & Microwave (HPRFM-2013), 4-6 September 2013 at IPR

The National Symposium on High Power RF & Microwave (HPRFM-2013) was held at IPR from 4-6 September, 2013. The Symposium was inaugurated by prof. R. Jha, Dean, IPR. More than 150 participants from all over India participated in this meeting. Twelve sessions of invited talks by eminent experts in the area of high power RF & Microwave RF, oral and poster presentations by participants were the highlights of the symposium. Mr. Raj Singh was the Convener of the symposium. A panel discussion was also organized to debate the future of this area of R&D in India. The participants were, A.V.G. Subramaniam (SAC-ISRO), P. K. Atrey (IPR), Vishnu Srivastava (CEERI), Sumit Som (VECC) and Manjari Pande (BARC). There was also an exhibition by industry sponsors. Below are a few visuals of the symposium.



Prof. R. Jha inaugurating the symposium



Panel discussion



View of the audience

Chhaya Chavda
Ramasubramanian N
Ravi A V Kumar
Shravan Kumar

The Team

Hiral B. Joshi
Prabhat Kumar
Priyanka Patel
Swati Roy



Panoramic photograph of IPR building—Ravi A. V. Kumar

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



Web : www.ipr.res.in
E-mail : newsletter@ipr.res.in
Tel : 91-79-2396 2000
Fax : 91-79-2396 2277