

Issue 050

September 2017

# The Fourth State

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

50<sup>th</sup> issue

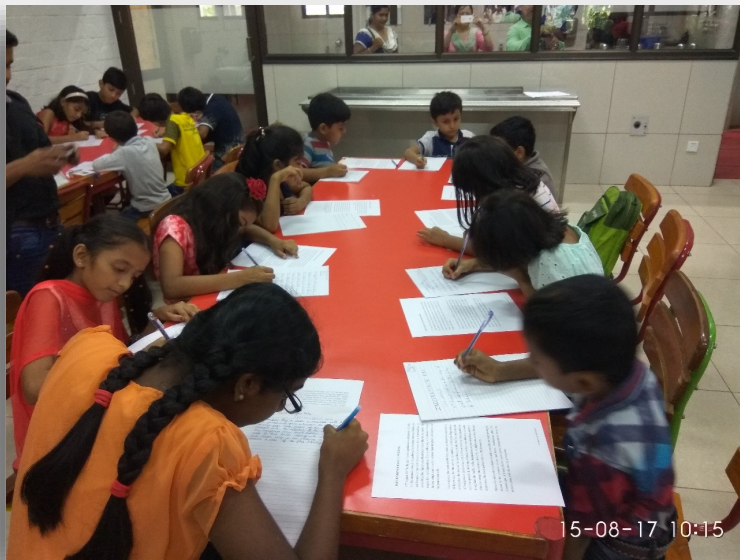
On the occasion of the 50th edition of the IPR Newsletter, we, the Newsletter team wish to thank the establishment for the continued support as well as to all the staff members of IPR, FCIPT, CPP and ITER-India who have contributed regularly to make the IPR newsletter a success. The Newsletter will forever remain as a documentation of events and preserve the memories of events that IPR celebrated for the future generations of IPR'ites. We hope that this tradition continues down the years !

## 71st Independence Day Celebrations @IPR



Director, IPR Dr. Shashank Chaturvedi, unfurling the national flag on 15th August 2017 at IPR

IPR celebrated the nation's 71st independence day at its main campus. Director, IPR unfurled the national tricolor, which was followed by the national anthem. Dr. Shishir Deshpande, Dr. Ajai Kumar and Shri Ujjwal Baruah were also present during the flag hoisting ceremony. IPR Director then spoke at length to the IPR staff present at the function regarding future plans of IPR. This was followed by snacks and various competitions for the IPR staff and their family. Children of IPR staff took part in the handwriting competition while adults took part in slow-cycle racing. The staff club also organized a talk on "hormone *imbalance, causes, symptoms and treatments*" by Dr. Om Lakhani. CIMS Hospital, Ahmedabad, provided a free health check-up comprising ECG, blood sugar levels, blood pressure to around 200 IPR staff and family members present on the day.



Handwriting competition in progress for the children of IPR staff



(L) Health checkup organized for IPR staff during the independence day (R ) Slow-cycle race for IPR staff



(L) Health related talk being delivered by Dr. Om Lakhani. (R ) View of the audience during the talk

## Congratulations !!



**Mr. Gattu Ramesh Babu**, Scientist from SST-1 Division, ran the Mumbai Ultra 12 hour Marathon on 13 August, 2017. Running barefoot on Mumbai roads from 5am to 5pm, he clocked an impressive distance of 77 kilometers.

He is an avid long distant runner and regularly participates in marathon races.

On behalf of IPR, the Newsletter congratulates him on his stupendous effort.



The 71<sup>st</sup> Independence Day was observed at CPP-IPR. Prof. K.S. Goswami hoisted the national tricolor in the presence of the staff members, students and other supporting staff of the centre, followed by the national anthem.



## CPP-IPR Support for Assam Flood Relief

Assam has experienced furious floods during the current monsoon season. Over hundred people have died and tens of thousands of people rendered homeless. On 22 July, with the help of a Guwahati-based non-governmental organization, PRI-YOBONDHU, CPP-IPR tried to reach out to the flood victims of Assam with relief materials. Regular/temporary staff members of CPP-IPR voluntarily contributed to the cause in the form of cash and or in kind.



(L) Dispatch of the items for the Assam flood relief from CPP-IPR. (R ) Distribution of the items to the flood affected people.

## Congratulations !



**Mr. Gaurav Bansal** (Fuel Cycle Engineering Division of the Plant Engineering Department), and **Mr. Anil Kumar Bhardwaj** (Tokamak Engineering Department) at ITER, France were awarded a cash prize of € 2000 each by the Director General, ITER, in recognition of their high performance and achievement of goals, which were demonstrated in the previous year.

**On behalf of IPR, the IPR Newsletter congratulates them on their achievement !**

**Mr. Gaurav Bansal**

**Mr. Anil Kumar Bhardwaj**





Samirsinh Chauhan

**Mr. Samirsinh Chauhan**, IPR research scholar, has successfully completed his PhD thesis title "*Studies on Magnetically Constricted Anode Plasma Source*". During his tenure he has developed a device to study the anode fireball and its mode switching behaviour. This device can also be used as an economical way of surface nano-patterning.



Mukul Bhatnagar

**Mr. Mukul Bhatnagar** successfully completed his PhD thesis title "*Growth Dynamics and Plasmonic response of Silver nanoparticles deposited on nanodots/nanorippled templates*". He was a JRF under DST-Nanomission funded project at FCIPT. As part of his research work, he performed optical modeling of nanoparticles arrays and MD simulation of their growth dynamics

## IPR@Exhibition at the Parliament

An exhibition on Science & Technology Innovations By Scientific Ministries And Departments Of Government Of India was organized for the Parliamentarians at the Parliament Annex in New Delhi during 28-Jul to 11 Aug 2017. IPR also exhibited some of the plasma based technologies like Plasma Pyrolysis and Plasma based treatment of angora wool at the exhibition which received good response from the visitors. Some of the MP's who visited the IPR stall and interacted with the IPR staff present there were Mrs. Renuka Chowdhury, Ms. Anju Bala, Ms. Veena Devi, Shri. Shri. Joy Abraham, Shri. E T Mohammed bashir, Shri. Devji Patel etc. Shri. Tapas Mandal (MP from West Bengal), also enquired if the plasma technology could be used for treatment of jute fiber industry in West Bengal. Dr. Sekhar Basu, Chairman - AEC and Secretary, DAE, also visited the exhibition and interacted with the DAE staff from various units.



(L) Inauguration by Shri A H Ansari, Hon'ble Vice President of India along with Smt. Sumitra Mahajan, Hon'ble Speaker - Lok Sabha and Dr. Harsh Vardhan, Hon'ble Minister of Science & Technology, Govt of India. (R) DAE Chairman with the DAE staff at the exhibition.



(L) MP's Anju Bala and Veena Devi and (R) Mr. Joy Abraham, MP at the IPR stall

Organized by the Chairperson, Department related Parliamentary Standing Committee on Science & Technology, Environment & Forests, the exhibition included departments such as Department of Space (DoS) / ISRO, DSIR/CSIR, Department of Atomic Energy, Dept. of Science & Technology, Dept. of Bio-Technology, Ministry of Earth Sciences. The purpose of the exhibition was to showcase home grown technologies to Member of Parliaments who can further help dissemination of the technology to general public. The DAE stall included showcasing of posters and model from units such as BARC, IGCAR, AMD, IPR, and ECIL. Models were displayed by BARC, IPR, IGCAR and mineral samples were showcased by AMD. IPR showcased plasma pyrolysis system model for plastic waste to energy and samples of plasma processed wool and jute displaying the property enhancement using plasma.



(L) Shri Sunil Bharala, Member - Khadi Udhyog, Meerut (R) Ms. Renuka Chowdhury and Shankarbai Vegad at the IPR stall



(L) Dr. Sanjay Jaiswal and Shri Giriraj Singh (MP and MoS - MSME) (R) Shri Suresh Prabhu (Minister of Railways)



(L) Dr. Vikas Mahatme, Ophthalmologist and MP from Maharashtra discussing plasma jet for biomedical applications. (R)

As a part of the IPR Staff Club's initiatives, distribution and planting of saplings was organized at the IPR main campus on 31-July-2017. Saplings of decorative plants as well as trees were distributed to the IPR staff members and many tree saplings were also planted by the staff members. This yearly activity helps in increasing the green cover of the institute.



Images from the "Clean Campus, Green Campus Programme"

IPR actively participated in the Indian National Exhibition-Cum-Fair-2017 from 17-20th August, 2017, at the Dinabandhu Andrews College, Kolkata. The exhibition was organized by the Bengal Human Resource Development Foundation, Kolkata. The 15 member delegation from IPR exhibited 5 interactive models based on various technology developed at IPR as well as applications of plasma for societal benefits.



Images from IPR's participation in the Science Exhibition at Kolkata

ITER-India CDCL group is responsible for design, manufacturing, installation and final acceptance of the ITER cryogenic distribution (CD) system as well as systems of cryolines (CL) and warm lines. The cryo systems, designed to take off heat load from SC magnets, cryo pumps and supporting structure in a reliable and efficient manner, distribute an average of 75 kW (at 4.5 K) and 1 MW (at 80 K) cooling power. It is built to operate at different scenarios including D-T operation so that the helium refrigerator/liquefier plants operate in steady state conditions even at the pulsed nature of the heat load at SC magnets. System comprises of seven cryogenics distribution boxes having different functions and interconnects subsystems through a complex and vast network to fulfil the requirement at three main nominal temperature levels; 4 K, 50 K and 80 K. Presently the project is in final design and manufacturing phase. The successful completion of prototype cryoline test and the cold circulator qualification test have boosted the confidence of the Team to go ahead with further progress towards their goals.



The CDCL group of ITER-India : 1<sup>st</sup> Row (L-R): Pratik Patel, Satish Badgujar, Ketan Choukekar, Uday Kumar, Vinit Shukla, Bikash Dash. 2<sup>nd</sup> Row (L-R): Srinivasa Muralidhara, Himanshu Kapoor, Nitin Shah, Hitensinh Vaghela, Vikas Gaur, Shk. Madeenavalli, Anuj Garg, Jotirmoy Das, Mohit Jadon

### Cryogenic Thermal Insulation on 80 K Shield of Superconducting Coils Ducts

To improve the thermal performance of TF and PF SC coils ducts, its 80 K thermal shield was insulated by the cryogenic 'O' grade thermal Flexible Elastomer Foam Nitrile Insulation. The huge frosting was observed during cool down on the duct and piping at SST-1 machine platform. The thermal performance and validation test of installed insulation is being checked during current running SST-1 experiment, no ice frosting was observed on duct's piping and surfaces. It was really challenging task of installing the insulation in complex network of piping, congested space and accessibility. The welding expertise of Shri S. J. Jadeja to carry out the high quality welding work within the space constraints of SST-1 Cryogenics interface has to be specially mentioned here. Contributor : *Rajiv Sharma*



Flexible Elastomer Foam Nitrile Insulation on SC duct piping and surfaces at 80 K Temp

ITER-India is pursuing R&D on two technologies viz. Tetrode and Diacode based systems, for the ITER Ion-Cyclotron RF Power Sources that are part of India's contribution to ITER project. The successful technology will be chosen for the main ITER deliverables. The R&D using Tetrode based system is in progress under a contract with Continental Electronics Corporation (CEC), USA. The assembly and integration of driver and final stage amplifiers along with all peripherals, interfaces and vacuum tubes completed successfully at ITER-India site. The high power (MW level) long pulse operation initiated on matched load condition and getting encouraging results. Power test of the global chain of amplifiers (HPA1+HPA2+HPA3) are conducted on matched load as (HPA=High Power Amplifier) – At 36 MHz: 1.5 MW for 2000s with required bandwidth at 40MHz, 45MHz and 55MHz: 1.0 MW for 2000s. A test run was conducted successfully at 36MHz: 1.7MW for 3600sec.



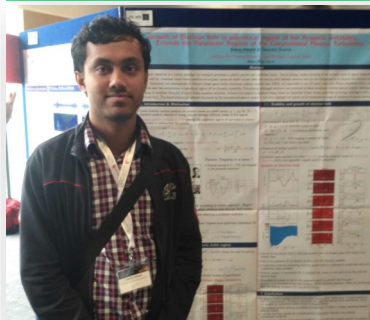
Tetrode based amplifier system at ITER-India site (L) side view (R) top view.

| Parameter                   | Value      |
|-----------------------------|------------|
| Gain of the Tetrode         | ~ 13.5 dB  |
| Anode efficiency            | ~ 66 %     |
| Max. output harmonics level | < - 20 dBc |
| Bandwidth at -1dB point     | ~ 2 MHz    |

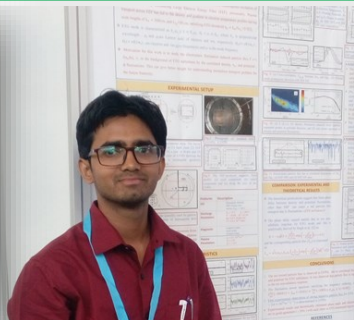
## Infrastructure Update - Neutronics Building



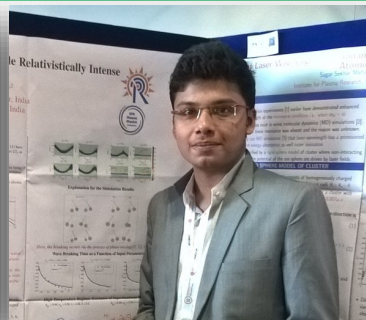
The construction of the Neutronics building is underway. All RCC works up to ground beam bottom level has been completed, and the back filling work is currently in progress.



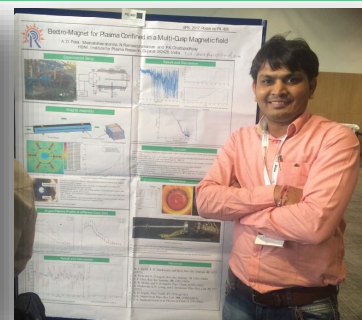
**Debraj Mandal**, 4th year PhD Scholar of IPR attended the 44th European Plasma Physics (EPS) 2017 - 43rd Conference on Plasma Physics held at Belfast, Northern Ireland during 26-30 June, 2017. He made a poster presentation entitled "*Growth of Electron hole in subcritical regime of Ion Acoustic instability : Extends the Parameter Regime of the Conventional Plasma Turbulence*"



**Prabhakar Srivastav**, 5th year PhD Scholar of IPR attended the International Conference on Phenomena in Ionized Gases (ICPIG-2017), Estoril, Lisbon, Portugal, from 9 to 14 July 2017. He made a poster presentation entitled "*Study of Turbulent Particle Transport in ETG Dominated Plasma of LVPD*"



**Arghya Mukherjee**, 5th year PhD Scholar of IPR attended the 44th European Plasma Physics (EPS) 2017 - 43rd Conference on Plasma Physics held at Belfast, Northern Ireland during 26-30 June, 2017. He made a poster presentation entitled "*Breaking of Large Amplitude relativistically intense waves in a warm plasma*"



**Amitkumar D. Patel**, 6th year PhD Scholar of IPR attended the 44th European Plasma Physics (EPS) 2017 - 43rd Conference on Plasma Physics held at Belfast, Northern Ireland during 26-30 June, 2017. He made a poster presentation entitled "*Electro-magnet for plasma confined in cusp magnetic field*"

## Hearty WELCOME to the IPR Family !

On behalf of IPR, the IPR Newsletter welcomes the following new staff who joined IPR in the recent past as permanent staff, post doctoral fellows and research scholars. We wish them all the very best in their career at IPR !



**Ms. Sneha Gupta**  
Scientist-SC  
Basic Theory & Simulation  
DoJ : 01-Aug-2017



**Mr. Vishal Gupta**  
Engineer-SC  
Cryopump and Pellet Injector  
DoJ : 1-Aug-2017



**Mr. D. Kumawat**  
Scientist-SC  
Aditya  
DoJ : 1-Aug-2017



**Mr. Jeta Ram**  
Office Clerk-A  
Administration  
DoJ : 25-Jul-2017



**Dr. B.P. Sahoo**,  
PDF, Theory and Simulation  
DoJ : 7-Aug-2017



**Mr. Lavanya Shukla**  
Research Scholar  
DoJ : 1-Aug-2017



**Mr. Prince Kumar**  
Research Scholar  
DoJ : 1-Aug-2017



**Mr. J. Mahapatra**  
Research Scholar  
DoJ : 1-Aug-2017



**Mr. R. K. Mohanta**  
Research Scholar  
DoJ : 1-Aug-2017



**Mr. K.S.P. Reddy**  
Research Scholar  
DoJ : 1-Aug-2017



**Mr. Jeet Vijay Sah**  
Research Scholar  
DoJ : 1-Aug-2017



**Mr. V.M. Pachchigar**  
Research Scholar  
DoJ : 1-Aug-2017

## Infrastructure Update @ CPP-IPR



The construction of the new canteen building at CPP-IPR is nearing completion. The interior finishing works are currently in progress and the building will be handed over to CPP-IPR and be fully functional by mid-September.

The new canteen is a single storied building having a total area ~430 Sqm and comprising of dining halls and a terrace space for community activities.

- ◆ **Dr. Harekrishna Yadav**, IIT, Mumbai, gave a talk on "Heat transfer from an impinging jet in presence of inlet oscillations" on 28th July 2017
- ◆ **Dr. Subrata Pradhan**, IPR, Gandhinagar, gave a talk on "High Ampacity High Temperature Superconducting (HTS) Bi-directional Cable Thermal Characteristics in Practical Utility Applications" on 03rd August 2017
- ◆ **Mr. Samirsinh Chauhan**, IPR, Gandhinagar, gave a talk on "Studies of magnetically constricted anode plasma source" on 07th August 2017
- ◆ **Mr. Ratan Kumar Bera**, IPR, Gandhinagar gave a talk on "Fluid simulation of electron beam driven wakefield in a cold plasma" on 09th August 2017
- ◆ **Mr. Ritesh Sugandhi**, IPR, Gandhinagar, gave a talk on "Investigation of Particle swarm optimization for multidisciplinary problems" on 09th August 2017
- ◆ **Mr. Gattu Ramesh Babu**, IPR, Gandhinagar, gave a talk on "A Matlab code for Magnetic field calculations due to arbitrary straight and circular electromagnets (MMAEM v.1.0) on 17th August 2017
- ◆ **Mr. Meghraj Sengupta**, IPR, Gandhinagar, gave a talk on "Studies in Non-Neutral Plasmas using Particle-in-Cell Simulations" on 18th August 2017
- ◆ **Dr. S. M. Ahmed**, Central Instruments Laboratory, University of Hyderabad, gave a talk on "Is there a Life on Mars ????" on 18th August 2017
- ◆ **Ms. Deepa Verma**, IPR, Gandhinagar, gave a talk on "The Study of Localized Solutions in Laser-Plasma System" on 21st August 2017

### Upcoming Events

- ◆ 21st International Stellarator-Heliotron Workshop (ISHW2017), Kyoto University, Japan, 2-6 October 2017
- ◆ 23rd International Conference on Ion Beam Analysis (IBA 2017), Shanghai, China, 08-13 October 2017, Athens, Greece, 9-12 October 2017,
- ◆ International Conference on Plasma Science and Applications (ICPSA2017), Walailak University, Thailand, 10-12 October 2017
- ◆ 14th International Conference on Plasma Based Ion Implantation and Deposition (PBIL&D 2017), Shanghai, China, 17-20 October 2017
- ◆ Applied Nanotechnology and Nanoscience International Conference – ANNIC 2017, Rome, Italy, 18-20 October 2017
- ◆ International Conference on Nuclear Science and Engineering, Guilin, China, 20-22 Oct 2017,
- ◆ 59th APS Division of Plasma Physics Annual Meeting, Wisconsin, USA, 23-27 October 2017
- ◆ ESM'2017 - 31st European Simulation and Modelling Conference, Lisbon, Portugal, 25-27 October 2017,

### Know Our Colleagues



**Mr. Vijaykumar K. Patel** joined IPR in 1997 as TTP-4 batch and later on in 1998 as an Engineer in the Aditya Data Acquisition & Control Group. He was involved in the design and development of APPS Control system and replaced the PDP-11 based system with a PC running RT-Linux. He also setup ADITYA file and print server for experimental data management and distribution on heterogeneous platform on IPR network. He had successfully replaced the PC based APPS control system using embedded real-time hardware and integrated the same with SST-1 control system. He was deputed to ITER organization from 2008 to 2013 where he worked in IT section and led various data management solutions to automate system engineering processes like document management, requirement management, change and configuration management, CAD data management and project management. On his return, he developed the IDRMS (IPR's Document and Record Management System). Since October 2016 he is with the Computer Division and is currently involved in the campus wide upgradation of computer networking and strengthening the network security.

**Mr. Gautam R. Vadolia** joined IPR in 1999 as an engineer at the Mechanical Workshop Section and was specifically assigned with the upgradation task of the facility. He was instrumental in introducing new indexable insert tools for the machines and the addition of new systems like Plasma cutting machine. Procurement of the waterjet cutting machine, the first of its kind as a computer controlled work shop machine, was also initiated by him. He was also associated with academic activities teaching IPR M.Sc Engineering (by Research) students and has contributed a chapter to the book "Plasma and Fusion science: From Fundamental Research to Technological Applications" on "Structural Fabrication: Study of Infrastructure Facilities Required to Convert Concept to Reality". He is presently with the FCIPT division and coordinates maintenance, production and management activities. He is a member of the Institution of Engineers (India), Indian Vacuum Society, Indian Institute of welding, PSSI, Indian Nuclear Society and the Ahmedabad Management Association.



### 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 Nair | Harsha Machchhar |