Issue 066 January 2019 News letter of the Institute For Plasma Research, Gandhinagar, Gujarat (India)

# Season's Greetings !

IPR Newsletter wishes all the staff members of IPR, FCIPT, ITER-India and CPP-IPR a very happy, safe and fruitful year ahead !

# Happy New Year

## 35<sup>th</sup> DAE Safety & Occupational Health Professionals Meet-2018

The 35<sup>th</sup> DAE Safety & Occupational Health Professionals Meet-2018 was jointly hosted by the Atomic Energy Regulatory Board (AERB) and Variable Energy Cyclotron Centre (VECC) from 27 to 29 November, 2018 at Kolkata. The themes for this year's meet were "*Leadership and Management of Safety*" for Industrial Safety and "*Requirement and challenges in health management – pre/during/post employment for Occupational Health*". This meet was inaugurated by Shri S.A. Bhardwaj, Chairman-AERB. About 180 delegates from various DAE units and DAE aided institutes participated in this meet.

From IPR, the meet was attended by Shri Sudhirsinh Vala, Shri Pramit Datta, Shri Chirag Bhavsar, Shri A. Baishya and Shri Bhavesh Prajapati. An oral presentation was presented on "*A Perspective on Virtual Reality in Safety Management*" by Shri Pramit Datta. A paper on "*Safety initiatives taken and implemented in various systems of negative neutral beam division of IPR*" by Shri Prajapati was selected for publication in the conference proceedings. Shri L.N. Gupta won the third prize for his Hindi safety slogan "सुरक्षा आदतों को सहज अपनाने की चुनौती है भारी, नेतृत्व एवम प्रबंधन से हल होगी इसकी कमियाँ सारी"



(L) Pramit Datta making his presentation (R) Sudhirsinh Vala receiving prize on behalf of Shri L.N. Gupta

#### Prototype EPICS Based Temperature Data Archive & Monitoring on 218S Platform

In SST-1 Cryogenic division, 80 K thermal shields temperatures especially on 80 K baffles need critical monitoring and data logging. A commercial temperature monitor is being used frequently for this purpose. This monitor is specially designed for low temperature sensor applications and has 8 channels in single unit, and is also equipped with RS-232 and GPIB interface for data communication.

IPR Data Acquisition and Control Division (DAC) and SST-1 Cryogenics Division have made collaborative efforts and developed in-house system with taking care of future expansion by using Open Source software tools EPICS and CSS. The EP-ICS based data acquisition system on Linux platform has been developed with data acquisition rate of 1 sec. The open source data base MySQL has been used for data logging. The system is developed in such a way that it can be extended for N numbers of the monitors.

Temperature data can be monitored from any PC on the network using a web browser without any additional software installation. The proof of concept, EPICS based monitoring system in function and is ready to be deployed for any project. The MySQL SCADA interface has also been successfully demonstrated. - *Vishnu Patel (DAC) and Dashrath P. Sonara, SST-1 Cryogenic division.* 



(L) The temperature data as viewed on a web browser (R) SCADA like functionality to view historical as well as live data.

#### Automation of LN2 Storage Tanks of SST-1 Cryogenic System at IPR

The cryogenic system of SST-1 consist of helium cryo plant system along with its sub-systems and liquid nitrogen (LN2) distribution system. The LN2 distribution system consists of three numbers of storage tanks (capacity of 35,000 litres each), 250-m long cryo transfer lines, sub-cooler Dewar, distribution for cryo and other miscellaneous application *viz.*, SST1 80K thermal shield, integrated flow distribution and control (IFDC) and current feeder system (CFS). The storage tanks are installed 250m away from control room and have a manual pressure and level measurement and control system. The control of pressure in LN2 management system is very essential in order to maintain 80K shield temperature. Manpower is essential to manipulate the pressurization and vent system of LN2 storage tank having manual valves for maintaining tank pressure. In order to reduce manpower and for ease of operation from control room, automation and remote operation of the pressurization and vent of LN2 storage tank was initiated. This was implemented by PID loop in PLC and SCADA programming. *Rohit Panchal, SST-1 Cryogenic Division* 



#### **IPR Annual Day**

IPR Annual Day was celebrated with fun and frolic on 1st December, 2018 at IPR. Around 1000 people, mainly IPR staff and their family members attended the function. Along with sumptuous evening snacks and high tea, there were various entertainment and cultural programmes by IPR staff and their family members. Awards were also given away by the Annual Day Celebration Committee to IPR staff and their family members for the special achievements in different sectors like academics, sports, social activities, cultural activities *etc*. The cultural program was followed by dinner. A *Garba* program was also organized after the dinner, in which enthusiastic IPR staff and family members took part. The OSMY award for the year 2018 was awarded to Ms. Hetal Patel for her outstanding contributions towards activities in the Administration Section.



# IPR Annual Day... Continued









Images from the IPR Annual Day Celebrations

#### **IPR Annual Day... Continued**



#### **OSMY Award - 2018**

Ms. Hetal D. Pathak who is working in Administration Section as Office Clerk "B" was awarded the "Outstanding Staff Member of the Year 2018 (OSMY).

Ms. Pathak joined the Institute on 22.8.2012. Initially she was handling Dispatch Section wherein she, on her own, made the whole section digital by doing entry in the computer and also maintaining hand written dispatch entries. Her ability to work and develop excel sheets required for dispatch need a special mention. Since February 2018, she has been handling IPR Identity Cards wherein again she developed the computerized Identity-card in place of hand written card, for the Project Students & visitors.

Ms. Pathak also did a lot of work in Hindi, specially making most of the forms, letters, etc. bilingual and it was she who set the ball rolling for the work in Hindi, that others followed her



Ms. Hetal D. Pathak

set the ball rolling for the work in Hindi, that others followed her suit and Admin 2 Section got the first prize for working in Hindi during January 2018. She has shown utmost sincerity and diligence and has displayed her meticulous and systematic outlook towards the tasks in hand. She plans and understands the work and also successfully completes the work in the stipulated timeframe. Her zeal to develop perfection and excellence is appreciable. In addition, Ms. Pathak's is exceptionally good in working on Computers (MS Office) & her knowledge & zeal for working in Hindi needs a special mention.

Ms. Pathak has impressed most of the staff members because of her pleasant demeanor and soft nature. She is a self-motivated person and is always focused on the work entrusted to her, and this quality has never made anyone feel that she physically challenged. On behalf of IPR, the Newsletter congratulates her on this achievement !



#### ADITYA-U Plasma Discharges Repeatability With Positive and negative Converter

**Positive Converter :** ADITYA Upgrade discharges repeatability was established with the application of horizontal plasma position control using two pairs of fast feedback coils powered by a dual polarity fast feedback power supply and excellent wall conditioning in toroidal belt graphite limiter configuration. The minimum base pressure of  $\sim 9 \times 10^{-9}$  Torr was

achieved. The time evolution of ADITYA Upgrade parameters discharges such as loop voltage (V), plasma current (kA), H<sub>a</sub> line intensity (a.u.), Hard X-rays (a.u.), Soft X-rays and gas puffs represents the discharges repeatability in ADITYA-U. The Plasma current of the order of ~90 - 100 kA and duration of ~ 80 - 90 ms was obtained. Only the positive converter was operational during these shots. So, the maximum Volt-sec was available up to ~80-90 ms.

Negative Converter : Another ADITYA-U Vacuum vessel baking cycle was successfully carried out from 14th -16th November, 2018 for maximum temperature ~130° C (44 h continues) including 2



Repeatability of Aditya-U discharges with Positive + Auxiliary converter

cycles of Hydrogen Glow Discharge Cleaning (GDC). Two major leaks, one in wire seal of (10-6 Torr) and one in PL-2 pumping line of (10-4 Torr) have been observed on 16th November, 2018. After solving all leaks minimum base vacuum of the order of ~ 5.6 x 10-9 Torr has been obtained for the first time in ADITYA-U tokamak. The available Volt-sec has been increased by adding a negative converter, with current -6 kA to -10 kA, to the positive converter having 12 kA to 12.5 kA of current in order to increase the discharge duration. The positive and negative converters are coupled using a thyristor based dual polarity converter with a circulating rectifier for the smooth transition from positive to negative converters. The time evolution of ADITYA Upgrade discharges parameters such as loop voltage (V), plasma current (kA), Ha line intensity (a.u.), and Hard X-rays (a.u.) represents plasma pulse length enhancement with negative convertor operation.



Temporal ADITYA-U discharges parameters describes plasma pulse length enhancement with negative convertor operation.

#### ITER Cooling Water System – Major Deliveries Made by ITER-India

India is contributing to the ITER project's cooling water system by the design, procurement and supply of ITER Component Cooling Water System (CCWS), Chilled Water System (CHWS) and Heat Rejection System (HRS). This consists a lot of piping and equipment that has been manufactured all over India and delivered to ITER. In recent months, major expediting of deliveries has been made. India has delivered almost 3000 piping spools, 8 chillers, 20 Horizontal Pumps, 10 Vertical Turbine Pumps, 6 Plate Heat Exchangers, Chemical Dosing System, 700 tons of piping supports, Ozonation System, Electrical and I&C equipment etc. These all account for the major shipments to ITER from India. Significant and exceptional coordination between ITER-India, industries and ITER Organization has played an important role in the manufacturing and delivery of so many equipment/systems to ITER site.



(L) Large capacity chillers (M) Horizontal Pumps (R) Chemical Dosing system



(L) Pipe spools installed at ITER site (R) Ozonation System

#### **IPR Groups & Divisions - Drafting Section**

The MESD Division has four sections namely Engineering Design & Analysis Section (EDAS), Drafting Section, Workshop Section and Inspection & Quality Section (IQS). The activities undertaken by the division is conforming to full product cycle which includes concept to commissioning. The Drafting section is headed by Mr. Bharat Doshi. This section of MESD is equipped with 6 licences of CATIA-V5 R13 installed on work stations for 3D modelling and 2D drawing preparation and HP inkjet T2300 plotter. Section has been supporting the users for designing and preparation of engineering drawings for various systems of IPR such as Aditya-Upgrade and SST1 Tokamaks, LVPD device and other experimental projects being executed at IPR, FCIPT and CPP-IPR.



Members of the Drafting Section of IPR (L-R) Vishnu Prajapati, Kirit Vasava, Swadesh Patnaik, Pinakin Leuva, Kanubhai Rathod and Bharat Doshi.

#### IPR @ Conferences



**Ms. Meenakshi Sharma,** 6th year PhD Scholar attended the 2nd Asia-Pacific Conference on Plasma Physics (AAPPS-DPP2018) at Kanazawa, Japan during 12-17 November. 2018. She gave a poster presentation entitled "Study of Ion Acoustic Wave in Inhomogeneous Magnetic Field of Multi-cusp Plasma Device".



**Dr. T. K. Borthakur**, SO(E), CPP-IPR, delivered a talk and presented a poster entitled "*Studies of High Speed Plasma Stream Generated from Pulsed Plasma Accelerator*" at the 2nd Asia - Pacific Conference on Plasma Physics (AAPPS-DPP 2018), held at Kanazawa, Japan, during 12 - 17 November 2018.



**Mr. Prabhakar Srivastav**, 6th year PhD Scholar attended the 60th Annual Meeting of the APS Division of Plasma Physics, Co-Located with the 71st Annual Gaseous Electronics Conference during November 5-9, 2018 at Portland, USA. He gave an oral presentation entitled "Exploring Role of Reynolds and Maxwell Stress towards shear layer formation in ETG turbulence dominated Large Laboratory Plasma".



**Mr. Donney Jigdung**, 1st year Ph.D. student of CPP-IPR, won the best oral presentation award at the 11th Biennial Conference of Physics Academy of North East (PANE-2018), which was held at Assam University, Diphu Campus, Assam, during 21-23 November, 2018.



**Mr. Neelanjan Buzarbaruah**, Ph.D. student of CPP-IPR, won the best poster presentation award at the International Conference on Renewable and Alternate Energy (ICRAE – 2018), which was held at Assam Science and Technology University, Jalukbari, Assam during 4-6 December, 2018.



**Dr. Amulya Kumar Sanyasi** received the Z H Sholapurwala Award for Fusion Research 2018 for his poster entitled "Amplification of Energetic Electrons Driven Whistler Mode by Loss Cone Induced Reflected Particles" presented at Plasma-2018 held during 4-7 Dec, at Delhi University,



**Dr. Kshitish Kumar Barada** of UCLA, USA was awarded the Parvez Guzdar Award for Young Scientists for the year 2018 for his contributions towards research in the areas of experimental studies of helicon plasmas, advanced plasma diagnostics and edge turbulence in tokamaks. The award was presented to him at Plasma-2018 held during 4-7 Dec, at Delhi University, Dr. Barada was a PhD scholar of IPR.



**Ms. Harshita Raj** was awarded the Best Oral Presentation award instituted by PSSI for her presentation entitled "*Dynamics of Runaway electrons in presence of MHD modes in ADITYA-U toka-mak*" presented at Plasma-2018 held during 4-7 Dec, at Delhi University,





### **Outreach : IPR Visits**

IPR Visits : November-December, 2018						
Name Of the Institution	Date	Number of visitors				
Dr. Vishwanath Karad MIT-World Peace University, Pune	29th November 2018	124 S. Y. B. Tech (Mechanical Engineering) students and 8 faculty members				
ISRO and Space Application Centre Ahmedabad	12th December 2018	81 newly recruited Scientists and engineers, as part of ISRO Induction Training Programme (IITP-31)				
Parul Institute Of Applied Science, Wagodia , Vadodara	20th December 2018	51 B. Sc. & M.Sc. (Physics & Maths) students and two Faculty members				



Students from Dr. Vishwanath Karad MIT-World Peace University, Pune, during their visit to IPR



Newly recruited scientists and engineers of ISRO, during their visit to IPR as part of their Induction Programme (IITP-31)



Students from Parul Institute Of Applied Science, Vadodara, during their visit to IPR

- **Dr. Jalaj Jain**, Comision Chilena de Energía Nuclear, Casilla 188-D, Santiago, Chile, and Center for Research and Applications in Plasma Physics and Pulsed Power, gave a talk on "*Basic studies on a hundred joules plasma focus device and its applications in biological sciences*" on 26th November 2018
- Dr. Subrata Jana, Institute for Plasma Research, Gandhinagar, gave a talk on "Design & simulation studies of normal conductors and superconductors based novel compact plasma sources & devices" on 27th November 2018
- Mr. Narayan Behera, Institute for Plasma Research, Gandhinagar, gave a talk on "Investigation of diamagnetism in laser-produced plasma" on 27th November 2018
- Mr. Amitkumar Patel, Institute for Plasma Research, Gandhinagar, gave a talk on "Study of plasma in a versatile multi-pole cusp magnetic field" on 28th November 2018
- Mr. Alamgir Mondal, Institute for Plasma Research, Gandhinagar, gave a talk on "Investigation of laser induced colliding plasma plume" on 10th December 2018
- Mr. Srimanta Maity, Institute for Plasma Research, Gandhinagar, gave a talk on "Molecular dynamics study of single particle and collective effects in dusty plasmas" on 10th December 2018
- Dr. Kirit Makwana, DESY Zeuthen, 15738 Zeuthen, Germany, gave a talk on "Nature of plasma turbulence and magnetic reconnection going from fluid to kinetic scales" on 14th December 2018
- Dr. Mohit P. Sharma, Institute for Plasma Research, Gandhinagar, gave a talk on "Heat transfer studies under single sided heating condition" on 18th December 2018
- Dr. Kaushik Choudhury, Institute for Plasma Research, Gandhinagar, gave a talk on "Design, Development and Implementation of an Integrated Micro-spectroscopy and Imaging Modality for Material Analysis" on 19th December 2018

#### **Upcoming Events**

- European Winter Conference on Plasma Spectrochemistry (EWCPS-2019), France, 3-8 February 2019 https:// www.ewcps.eu/
- Conference on Nuclear Training and Education: A Biennial International Forum (CONTE 2019), St. Augustine, FL, United States, 5-7 February 2019 http://www.ans.org/meetings/c\_2
- International Conference on Photonics, Metamaterials & Plasmonics (PMP-2019), Jaypee Institute of information Technology, Noida, India, 14-16 February 2019 http://pmpjiit.com/
- International Power Summit 2019, Berlin, Germany, 20-22 February 2019 http://www.arena-international.com/ips
- 22nd Annual Energy, Utility & Environment Conference (EUEC-2019), San Diego, California, 25-27 February 2019 http:// www.euec.com/

#### **Know Our Colleagues**



**Ms. Pramila Gautam** joined IPR in July 2001 in the Electronics & Instrumentation Division. She has contributed individually as well as a team member in the design of Signal-Conditioning Electronics, testing, installation, commissioning, routine operation and maintenance of different types of plasma diagnostics like Soft X-Ray, PMT, Microwave, Langmuir -probe etc. for Aditya, SST-1, Aditya-Upgrade and basic plasma experiments. She has expertise in analog and digital circuits, microcontroller based circuits, FPGA based circuits, c-RIO. She has significantly contributed to the development of electronics for Langmuir probe in Aditya-Upgrade, SYMPLE, IPR EXTENSION lab, NBI *etc.*, and in team work for the development of indigenous DAQ installed in Aditya-Upgrade. She actively participates in staff-club activities, organizing national conferences (PSSI 2017), internation-al conferences (IAEA 2015, FEC 2018) and also is part of the IPR science day organization team.

**Dr. Mukesh Ranjan** joined IPR in March 2002 as Scientist-SC at FCIPT/IPR. In the initial years of his career he has worked for plasma diagnostics and processing projects for various organisations like Plasma Sterilization System (J&J, USA), Plasma plume diagnostics of Hall Effect Plasma Thrusters (LPSC/ ISRO Thiruvananthapuram & Bangalore), Space Plasma Interaction Experiments (SPIX, ISAC/ISRO, Bangalore), and Cu coating on a flexible Lexan antenna (SAC/ISRO, Ahmedabad). Later in the year 2007-2010 he went to HZDR, Dresden (Germany) to complete his PhD and on his return to FCIPT, he began working in the field of plasma material interaction and nano-patterning with ion beams and their various applications. With this knowledge he helped LPSC/ISRO in the thruster anode liner material erosion experiments and also working on molecular sensing using nanoparticles and trying to detect earlier detections of fatal diseases in collaboration with Tata Memorial Cancer Research Institute (TMC, Mumbai). Currently Dr. Ranjan is working as a Scientific Officer-F in Plasma Surface Engineering Group (PSED) at FCIPT/IPR and has successfully completed 30 external research projects both national (for ISRO, DST, IITS, BARC,CSIR, Universities, private companies, etc.) and international (Indo-UK, Indo-German, Indo-Italy etc.). He received DAE-SSPS young scientist awards in the year 2015.



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