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The Fourth State

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

SST-1 Update

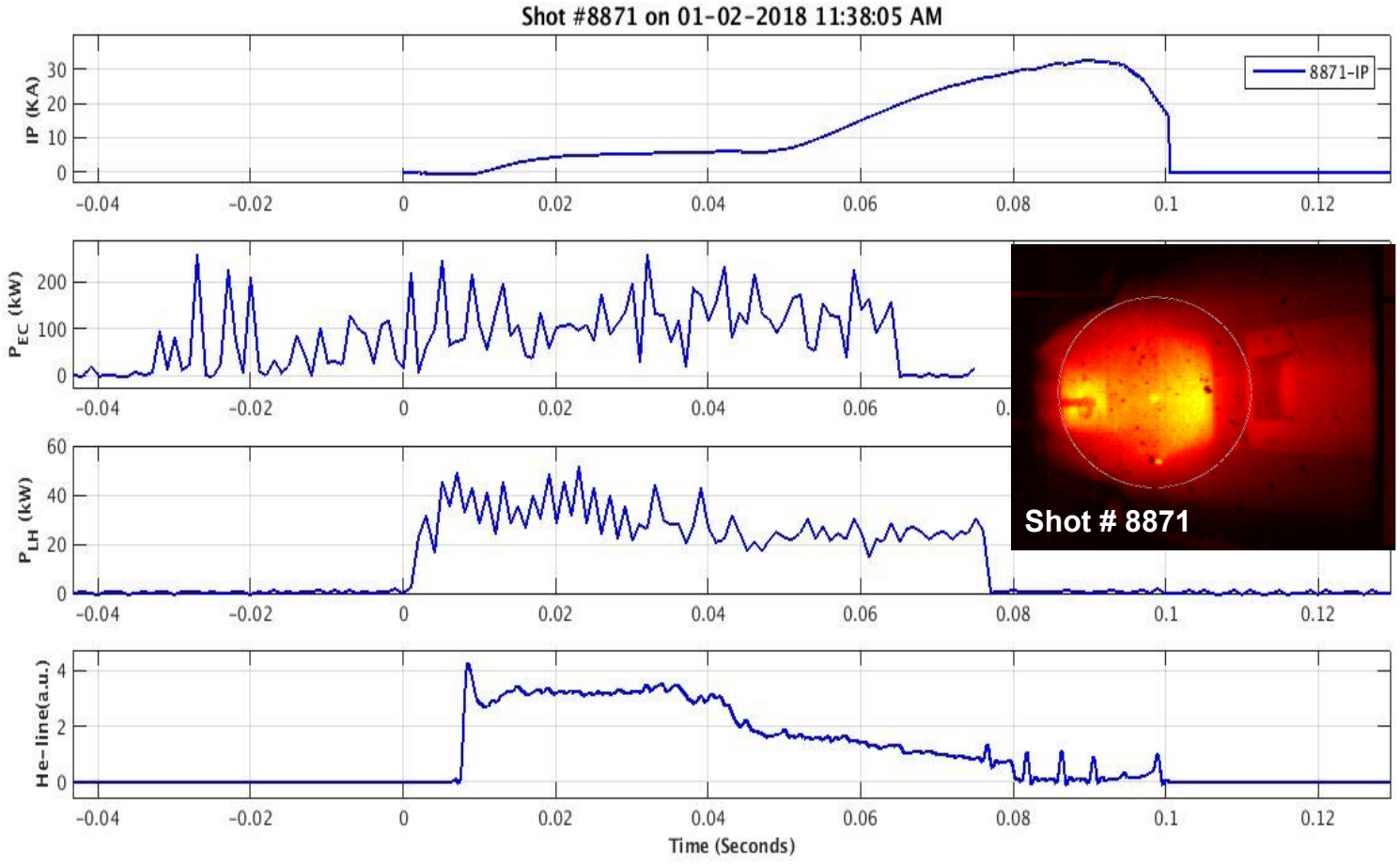
After a series of upgrades and refurbishments, the simultaneous cool down of TF and PF coils have been carried out while the case was hydraulically bypassed, and both the TF and PF coils were taken to its superconducting states. The TF coils were then charged for the first time up to 7.9 kA (which corresponds to 2.5 T at R=1.1 m) and the long pulse operation of TF coils at1.5 T was carried out with a flattop of 23,280 seconds. Low loop voltage Helium plasma current startup experiments were carried out assisted by ECR and Lower Hybrid. ICRH wall conditioning experiments were also carried out at both 1 and 1.5 Tesla. The main objectives of the recent SST-1 Campaign were ;

(A) Study the Heat load mitigation and its impact on:

- **Simultaneous cool down of TF and PF coils**
- **Enhanced cool down performance of PF-3 coils**

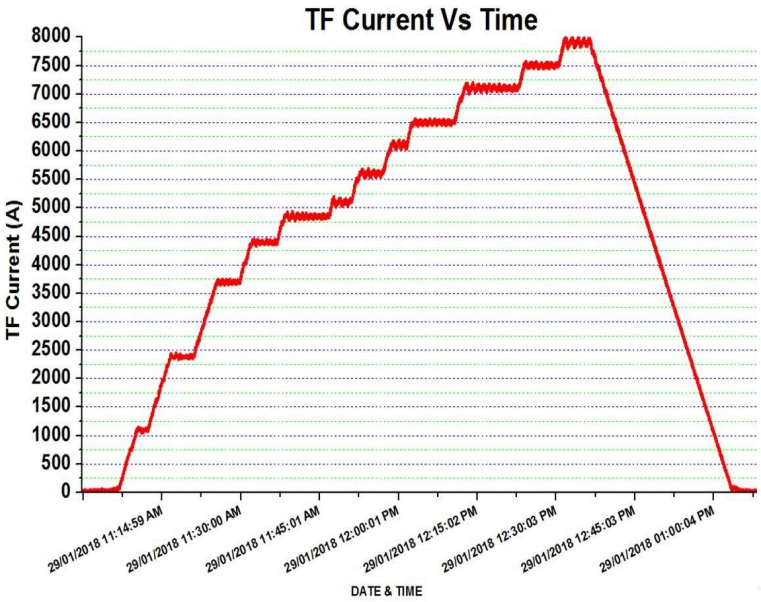
(B) A few planned experiments :

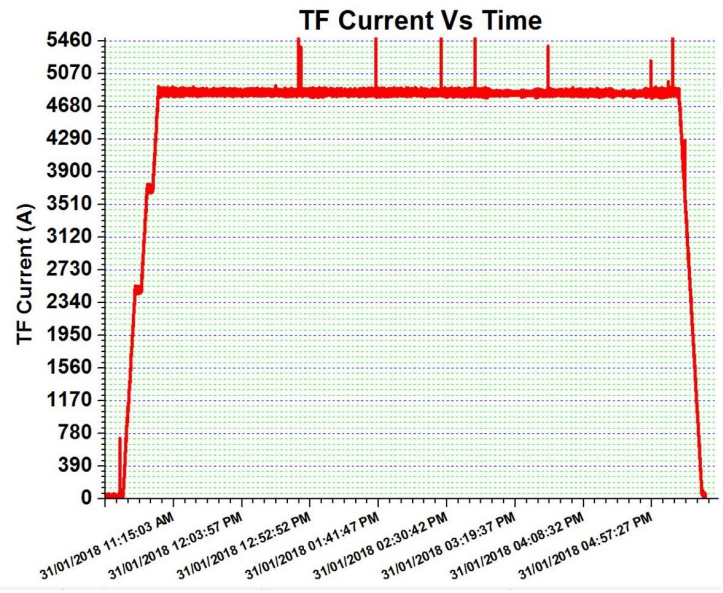
- **Enhancement of toroidal magnetic field towards its design value (3T @Major radius of 1.1 m)**
- **Steady state long pulse operation of Toroidal field magnets**
- **Low loop voltage Helium plasma current startup experiments - assisted by ECR and Lower Hybrid.**
- **ICRH wall conditioning experiments**



Low loop voltage Helium plasma startup experiments . INSET : Image of the plasma

SST-1 Update .. Continued





(L) TF magnets charging at 7.9kA (2.5T @R=1.1m) **(R)** Long pulse operation of TF magnets at 4.7kA (1.5T) - flat-top of 23,280 seconds

R-Day @ CPP-IPR

The 69th Republic day was celebrated at CPP-IPR on 26th January, 2018. Center Director, Prof. K. S. Goswami unfurled the national flag in the presence of the CPP-IPR staff and security personnel.

Martyrs' Day

On 30th January, 2018, a two minute silence was observed by IPR staff who assembled in the portico of the IPR main building to mark the Martyrs' Day in memory of those who sacrificed their lives for India's freedom struggle.

Staff members observing the Martyrs' day at IPR

Basic EPICS Workshop @ IPR

The LIGO Division of IPR organized a two-day "Basic EPICS Workshop" on 30-31st January at IPR with the support of DAC and ICH & CD Divisions of IPR/ITER India. The workshop was attended by scientists and engineers of collaborative institutes involved in building the LIGO INDIA detector as well as those involved in various LIGO control systems. In total, 30 participants from IPR, RRCAT Indore, IUCAA Pune and IIT Chennai attended the workshop. EPICS (Experimental Physics & Industrial Control Systems) is an open source software development environment which is being used for development of various local and supervisory control systems in present and upcoming LIGO detectors as well as particle accelerators, telescopes and other large physics experiments. Speakers from IPR delivered talks on various topics related to LIGO controls and EPICS during the workshop. Hands-on practice sessions were also organized as part of the workshop on 31st January at the LIGO Laboratory in Gandhinagar.

Images from the 2-day Basic EPICS Workshop

IPR @ Gujarat Science Congress

IPR participated in the 32nd Gujarat Science Congress which was organized by the CSIR-Central Salt & Marine Chemicals Research Institute and M.K. Bhavnagar University, at Bhavnagar Gujarat during 4-5 February, 2018 under the aegis of the Gujarat Science Academy. IPR being one of the co-sponsors of the event, also participated in the science exhibition organized during the event. Various working and non-working science models as well as exhibits to showcase the technologies developed by IPR were exhibited for the benefit of the participants of the science congress. Around 600 visitors, including academicians, senior faculty members, students (UG, PG and PhD in various science streams) as well as other participants of the science congress visited the IPR stall.

Super Blue Blood Moon

The combined unique phenomena of a supermoon (moon at its perigee), a blue moon (second full moon in a month) and a total lunar eclipse made this event a “super blue blood moon”. This was observed over many parts of India on 31-Jan-2018. Even though the eclipse peaked during the rising phase of the moon and the haze over the horizon made the red moon look very faint, it was still possible to observe this unique celestial phenomena over Ahmedabad. These pictures were shot at IPR during the various phases of the event. Photo – Ravi A V Kumar

IPR Infrastructure

In the Neutronics Laboratory, the external plaster work as well as the steel work for the neutron generator room slab are under progress. In the Laboratory building, installation of the fire fighting equipment and HVAC are in progress. , is currently being installed. The work on the road between the Laboratory and Auxiliary buildings are in progress. Dry wall partition is completed in the ground floor and is in progress on the 1st and 2nd floors. Electrical Light fixtures have been installed on Ground and 1st floor mezzanines and other internal electrical works are in progress. Painting of doors, windows and internal walls is also underway.

Work progress of the Neutronics laboratory (L) External Plaster work being carried out (R) Steel work of the slab of the neutron generator room.

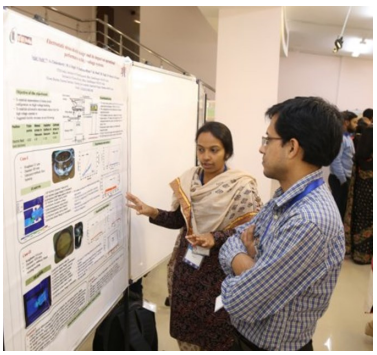
Laboratory Building (L) Installation of fire-fighting systems in progress (R) Construction of road between Laboratory and Auxiliary buildings under progress.

View of the exterior of the Laboratory building that is nearing completion

IPR @ INPAC-2018

IPR participated in the Indian Particle Accelerator Conference – 2018 (InPAC 2018), which was organized at the Raja Ramanna Centre for Advanced Technology (RRCAT), Indore during January 9-12, 2018.

(L-R) Mr. Arun Chakraborty, Dr. M. J. Singh, Mr. Himanshu Tyagi and Mr. M. R. Bhuyan delivering their presentations




(L) IPR contingent at INPAC 2018 : (L-R) Sejal Shah, Jaydeepkumar Joshi, A.K. Chakraborty, M.J. Singh, Himanshu Tyagi, Manas Bhuyan, Ravi Pandey and V. Mahesh.

(C) Sejal Shah during her poster presentation.

(**R**) Ravi Pandey receiving the second prize for his poster presentation.

Person	Presentation	Title of the presentation
A. K. Chakraborty	Invited	ITER Beams – Technology and R&D – the Indian Perspective
M. J. Singh	Oral Paper	A test facility for production and characterization of 60 A, 100 keV beam produced from a single, large RF ion source
Himanshu Tyagi	Oral Poster	EPICS based Slow Controller for Data Acquisition and Control System of Indian Test Facility for ITER DNB
Manas Ranjan Bhuyan	Oral Poster	1. Overview of versatile diagnostics development under NNBI program in IPR 2. Time evolution of optical emission spectrum of plasma and source performance in surface mode of ROBIN
Jaydeepkumar P. Joshi	Poster	1. Manufacturing experience of a large, 60 A, 100 kV ion source, for a negative ion neutral beam injector 2. Design, Manufacturing and Testing of High Speed Cryopump for Application of Beam-line and Accelerator
V. Mahesh	Poster	Fault energy dump & Repeated Breakdown validations of High voltage power supplies commissioned for extraction and acceleration of ions in ion source
Sejal Shah	Poster	Electrostatic stress shields design and its impact on operational performance on high voltage systems
Ravi Pandey	Poster	Vacuum Brazing Route for Manufacturing of Large Size Ion source
Sudhirsinh Vala	Poster	Neutron diagnostics for accelerator based 14-MeV neutron generator

IPR Staff Club - One-Day Picnic

IPR Staff Club organized a one-day picnic for IPR staff and family members to Narmada Dam (Kevadia Colony) and Poicha on 17th February, 2018. More than 250 members joined the picnic. The tour covered two well known places *i.e.,* the Sardar Sarovar Narmada dam and the newly built Neelkanth dham temple at Poicha, The tour started at 6:00 in the morning and returned back same day at midnight after having dinner at Poicha temple. . IPR staff also got an opportunity to visit the power generation facility at the dam. Lunch was organized at Garudeshwar near the Sardar Sarovar Dam. On the whole, it was a very enjoyable trip for IPR staff and family.

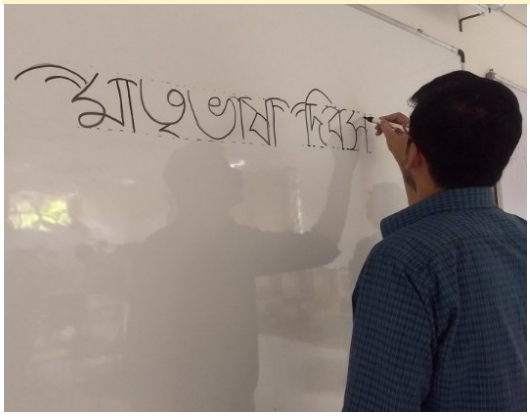
Images of Sardar Sarovar Dam taken by IPR staff during the picnic

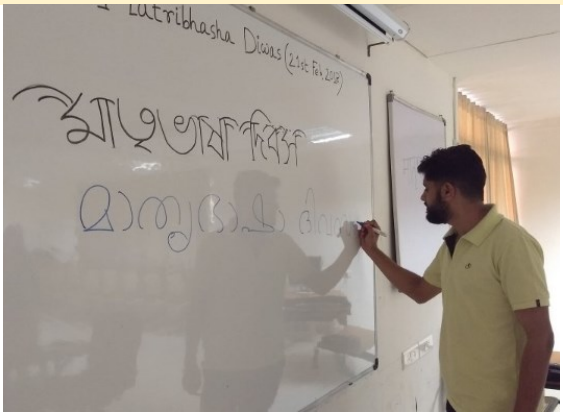
Visit by Head, TTDC, BARC

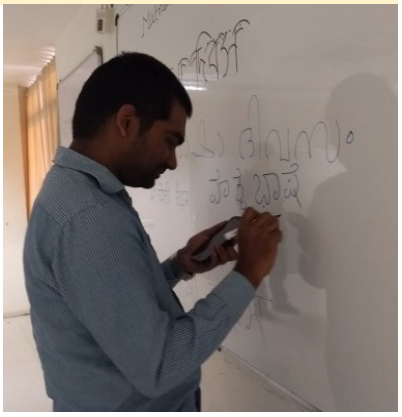
Shri. Shrikrishna Gupta, Outstanding Scientist and Head, Technology Transfer and Collaboration Division (TTCD), BARC, Mumbai, visited IPR on 22nd February, 2018. He also delivered a lecture on "*DAE Spin-Off Technology Transfer Procedure and its Benefits*"".

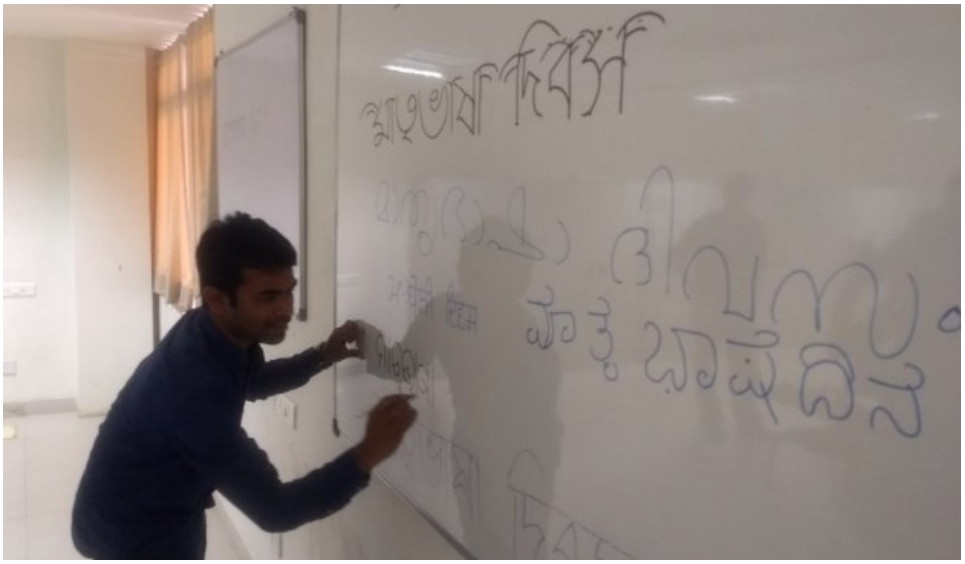
Matrubhasha Divas @ IPR

UNESCO has declared February 21st as the “Mother Language Day” and this was celebrated as the “*Matrubhasha Divas*” at IPR. One of the main objectives behind celebrating this day is to sensitize people about the need for greater use of their mother tongue and other Indian languages. Apart from this, It also highlights the need to impart, among people, better communication skills and proficiency in ones own mother tongue as well as other Indian languages. At IPR, the research scholars and faculty members spoke in their mother tongue, recited poems and exhibited their skills in writing in their mother tongue. This also draws attention of people to the diversities of cultures and consequent forms of art & literature in India.









Plasma Surface Engineering Division (PSED) @ FCIPT

Plasma Surface Engineering division in FCIPT is responsible for all surface modification activities including developing coatings for various applications. Some of these coating processes are plasma nitriding and plasma based physical vapour deposition. PSED has been involved in design, manufacturing, installation and commissioning of plasma nitriding and plasma physical vapor deposition system in universities as well as in industries. Apart from these optimization studies of improving the efficiency of cheap CZTS based solar cells is in progress. Another major thrust area of this division is to use plasma in healthcare units using atmospheric plasma jet. Recently, studies on developing nano-patterned templates for early detection of diseases have been initiated. PSED has also worked in collaboration with ISAC to study the interaction between satellite solar panels and space plasma and LPSC for the erosion of thruster anode material.

Members of the **Plasma Surface Engineering Division (PSED)**: **Front Row (L-R)** Keena Kalaria, Alphonsa Joseph, Vijay Chauhan, O. R. Kaila; **Middle Row (L-R)** Anand Visani, Akshay Vaid, Sagar Agarwal, N. P. Vaghela, Suryakant Gupta; **Last Row (L-R)** Mukesh Ranjan, Sooraj K. P, A. Satyaprasad, Ramkrishna Rane, Gautam Vadolia, Ghanshyam Jhala.

Observance of the *Swachhta-Pakhwada* @ IPR

"Swachhta-Pakhwada" was observed at IPR during 16-28 February, 2018. This initiative, which is part of the "*Swachh Bharat Mission*" of the Government of India was started in April 2016 and is observed by all Government establishments. All DAE establishments observed this during 16-28th February. As part of this drive, IPR staff were motivated to clean their offices and laboratory spaces and clear away unwanted materials. IPR also plans to award prizes for the most clean office / laboratory spaces in IPR.

Images from the "*Swachhta-Pakhwada*" observed at IPR during 16-28 February, 2018

Past Events @ IPR

- ***Dr. Mukul Bhatnagar,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Wetting properties of polytetrafluoroethylene (PTFE/Teflon) thin films deposited on glass substrates through RF Magnetron Sputtering*" on 23rd January 2018
- ***Dr. Jitendra Kumar,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Development of Microwave Coupling System for SYMPLE*" on 24th January 2018
- ***Dr. Deepa Verma,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Stability of flat-top soliton in transverse direction*" on 25th January 2018
- ***Dr. Chandrasekhar Shukla,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Intense (10 ~19w/cm2), short pulse (~fs) laser interaction with structured target*" on 25th January 2018
- ***Mr. Amulya K. Sanyasi,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Study of Plasma Turbulence in Large Volume Plasma Device (LVPD)*" on 29th January 2018
- ***Dr. U. Fantz,*** Max Plank Institute for Plasma Physics, Graching, Germany, gave a talk on "*Present Status of RF-ICP Negative Ion Source Development at IPP*" on 12th February 2018 (Colloquium # 282)
- ***Dr. B. Heinemann,*** Max Plank Institute for Plasma Physics, Graching, Germany, gave a talk on "*Technical challenges in NNBI systems – experiences and further plans at IPP*" on 13th February 2018 (Colloquium # 283)
- ***Dr. C. Hopf,*** Max Plank Institute for Plasma Physics, Graching, Germany, gave a talk on "*Neutral Beam Injection for the European DEMO*" on 14th February 2018 (Colloquium # 284)
- ***Dr. Sunil Kumar,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Impact of neutron irradiation in Al2O3*" on 14th February 2018
- ***Dr. Neeraj Chaubey,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*External control of the synchronization dynamics of two inductively coupled glow discharge plasma sources*" on 16th February 2018
- ***Prof. Anil Gangal,*** IISER, Pune, gave a talk on "*Calculus and Differentiable Dynamics on Fractals Physical Relevance and Applications*" on 16th February 2018 (Colloquium # 285)

Upcoming Events

- 2018 Northwest Energy System Symposium, University of Washington, United States, 4-5 April 2018. http://nwess.ee.washington.edu/2018/
- IOP Annual Nuclear Physics Conference 2018, University of the West of Scotland, Paisley, Scotland, 4-6 April 2018. http://nuc18.iopconfs.org/home
- IOP Magnetism Conference 2018, University of Manchester, UK, 9-10 April 2018. http://magnetism2018.iopconfs.org/home
- 45th IOP Plasma Physics Conference 2018, Institute of Physics, University Belfast, United Kingdom, 9-12 April 2018 http://plasma2018.iopconfs.org/home
- 22nd Topical Conference on High Temperature Plasma Diagnostics (HTPD 2018), San Diego, United States, 16-19 April 2018 https://www.aps.org/meetings/meeting.cfm?name=HTPD18
- 2018 Joint ICTP-IAEA School and Workshop on Fundamental Methods for Atomic, Molecular and Materials Properties in Plasma Environments, Trieste, Italy, 16-20 April 2018. http://indico.ictp.it/event/8305/

Know Our Colleagues

Mr. Vishal Jain, an electrical engineering graduate from SGSITS, Indore, joined the Institute at FCIPT in year 2000 as Engineer-SC and presently is a Scientific Officer-F . His areas of interest are design and development of power sources for thermal and non-thermal atmospheric pressure plasma generation. He contributed to the design and development of power supply and control system for Plasma Pyrolysis, DBD Plasma for textile application and Plasma Activated Water. He also worked on power sources for RF and Microwave Plasma. He is one of the authors of 6 Indian patents for these technologies out of which two patents have already been transferred to 5 industries. He recently submitted his Ph.D. thesis to Indian Institute of Technology Bombay in electrical engineering.

Mr. Vishnukumar Patel joined the Institute in 2000 with the Electronics Group and participated in the development of electronics for SST-1 Diagnostics. He joined SST1-NBI group in 2004 and was responsible for the design of the control and interlock system for the NBI system. He designed data acquisition and storage system for the NBI and was also involved in the design of filament power supply with EMI-EMC compliance for the uninterrupted operation of the system. He also supported the NBI Cryogenics plant commissioning and in whole was working in three major areas of engineering viz Control, Instrumentation and Power supply. He was in France from 2012 to 2017 where he contributed in CODAC Section of ITER and developed EPICS drivers for ITER fast controller boards. He was also working for I&C support in ITER. He acquired expertise in the fields of control engineering works throughout his carrier, specifically in EPICS, PXI, VME, VXI, PLC and LabView Programming. Presently he has been posted to DAC Division of IPR.

The IPR Newsletter Team

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