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Issue 12

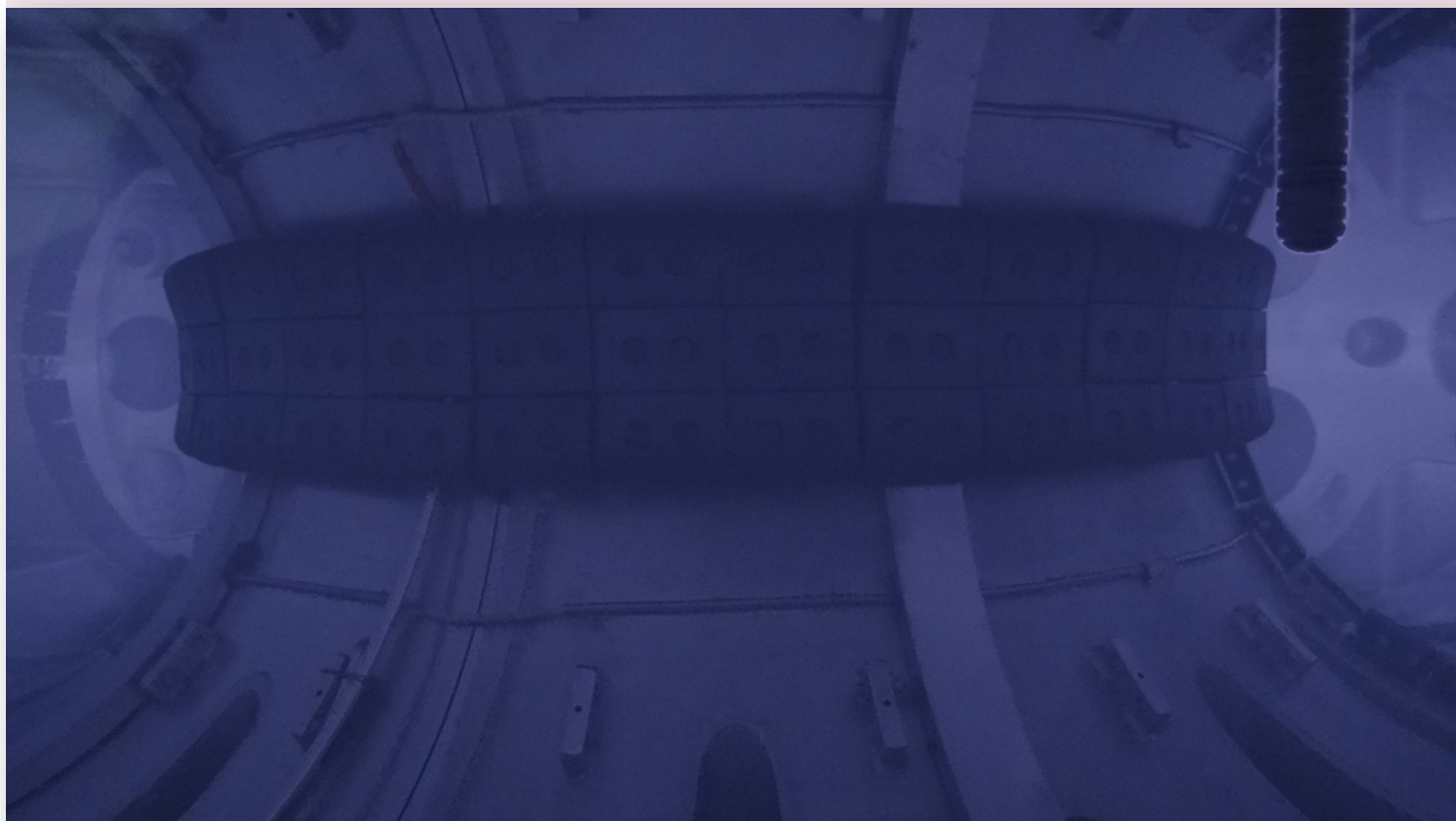
December 2016

The 4th State

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

Aditya-U - Update

Aditya-U vacuum division has closed all the ports of the vessel, after completing installation of Phase-1 in-vessel components, viz., the toroidal and poloidal limiters, toroidal loops, diamagnetic rings, Rogowskii rings etc. After successfully leak testing of the vessel, it was again vented and the pneumatic operated GDC anodes (2 nos.), gas feed valves and components on various ports for initial plasma operation for phase-1 diagnostics, viz Microwave, Bolometer, Soft X-ray, Imaging, Probe, Spectroscopy, Infrared were installed. Once again the vessel was evacuated and leak tested successfully. Once the base vacuum 2×10^{-7} Torr was achieved, the Glow Discharge Cleaning (GDC) system was tested successfully with required safety and operational interlocks. The image shows the in-vessel view under GDC glow with toroidal limiter, GDC anode, toroidal loop, poloidal limiters, magnetic diagnostics rings etc. Currently, the wall conditioning of Aditya-U vessel and first wall components by GDC is ongoing and it runs continuously for 12 hours during night. Other wall conditioning setups of ECR-DC and PDC are in final stage of installation and testing.



The Glow Discharge Cleaning (GDC) of the Aditya-U vessel in progress

IPR Technology Transfer

A technology transfer agreement for 'Atmospheric pressure inline plasma treatment technology for textiles' was signed by and between IPR and M/s Arshad Electronics Pvt. Ltd. (AEPL), Mumbai on 9th November 2016 at IPR, Bhat, Gandhinagar. The transferred technology will be absorbed by AEPL and used for inline treatment of textiles and plastic films. AEPL has been into the business of manufacturing corona treaters for textile and plastic film processing and the atmospheric pressure inline plasma technology will enhance their product portfolio and will enable them to stay abreast on the technology front. M/s AEPL plans to showcase the plasma treater in an industrial exhibition in January 2017.



Dr. Shashank Chaturvedi, Director IPR, along with other members of Indian delegation of ITER Council, i.e, ITER India Project Director Dr. Shishir Deshpande and Mr Ujjwal Baruah from IPR, Dr. R B Grover and Mr Arun Srivastava from DAE, visited ITER France from 15-19 November 2016 to participate in the ITER Council meeting. During his visit, Dr. Chaturvedi addressed two meetings. On November 17th, he, along with the other members, addressed the personnel deputed to work in ITER/CEA from Indian institutes and industry like IPR / L&T / BARC etc. In this meeting delegates discussed the DAE vision for participation in the ITER program. They also answered the queries raised by participants. On the same day, a dinner was organized at Aix-en-Provence for the delegates as well as those deputed to ITER & CEA.

On November 18th, Dr. Chaturvedi addressed the gathering of employees from IPR who were deputed to ITER and CEA. g at ITER and at CEA. During his interaction, he emphasized the need to focus on short term projects and promote ideas / projects which will have a direct societal benefits, based on individuals work backgrounds & work exposure at ITER/ CEA. He also shared his plans to address Scientific / Technical / Administrative matters of the institute.



Images from IPR Director's visit to ITER France.

The 33rd DAE Safety & Occupational Health Professionals Meet was organized by IPR during 23-25 November, 2016. The meeting was organized by IPR at the Entrepreneurship Development Institute of India (EDI) campus, which is close to the IPR campus. The themes for this year's meet were "Safety in High Power and High Energy Advanced Technologies" for Industrial Safety and "Clinical Applications of Lasers" for Occupational Health. The three day meeting was inaugurated by Shri S.A.Bhardwaj, Chairman, Atomic Energy Regulatory Board (AERB). During the inauguration ceremony, Dr. Shashank Chaturvedi, Director, IPR, Shri Shukla, ED, AERB, Dr. Chenna Reddy gave brief speeches. The conference proceedings, Monograph on the themes as well as a CD of safety posters was also released during the inaugural session. The AERB safety awards were presented by the Chairman AERB, while the award for the winners of the conference logo were given away by Dr. Chaturvedi. Prof P I John, Ex-Senior professor of IPR delivered the Dr. S.S. Ramaswamy Memorial Endowment Lecture on "*Energy and Environment: Plasma Processes for Decarbonization*" This was followed by the inauguration of the safety exhibition. Dr. Sanjay Kulkarni and Shri. Ujjwal Baruah delivered invited talks on "*Safety in High Power RF and Microwave Sources for Fusion Reactor*" and "*Occupational Hazards with experimental High Voltage Systems*" respectively. About 180 delegates from various DAE units and DAE aided institutes participated in this meet.



(L-R) Shri S A Bharadwaj lighting the lamp. Dr. Shashank Charurvedi and Dr. Chenna Reddy speaking during the inaugural function.



(L) Professor P I John delivering the Dr. S.S. Ramaswamy Memorial Endowment Lecture. (R) View of the audience



(L) The dignitaries on the podium. (R) Master Atiksh Gupta, receiving the prize for the logo competition.



(L-R) Shri S A Bharadwaj inaugurating the exhibition. Dr. S V Kulkarni and Shri Ujjwal Baruah delivering their talks

A total of seven papers were presented by IPR staff at this meeting. Mr. Rajiv Sharma presented a paper on “Experience with Cryogenics Safety, Problems and Solutions”, Mr. D.V. Modi presented a paper on “Advanced Fire Prevention Techniques for ITER-India Laboratory Building, IPR”, Mr. L.N.Gupta presented a paper on “High Voltage Discharge Switch for operational safety of Neutral Beam High Voltage Power Supply System” Mr. Prakash Parmar presented a poster on “HVWS Fire Protection System for power Transformer at 132 KV Sub-Station”, Mr. Gautam Vadolia presented a poster on “Safety Legislation and Regulations for Electron Beam Welding” Mr. Mayank Makwana presented a poster on “Safety Management and Safe Handling of Materials in Lithium Ceramic Development Process” and Ms. Shweta Upadhyay presented a poster on “Safety and Shielding Management for Pulse Power Laboratory at IPR”. Competitions were also held under the auspices of the conference. Master Atiksh Gupta, son of Shri C.K. Gupta (IPR) won the first prize for LOGO competition while Mr. Silel Shah and Dr. Sandhya Dave won second and consolation prizes for Hindi Safety Slogan Competition respectively. Ms. Unnati Patel won the 3rd prize for Gujarati safety slogan competition.



(L-R) Mr. Gautam Vadolia with his poster. Dr. Sandhya Dave receiving prize for slogan competition. Shri P K Atrey receiving the memento from Dr. Reddy.



(L) Ms. Unnati Patel receiving the prize for Gujarati slogan. (R) Release of the conference proceedings.



(L) Dr. Chenna Reddy presenting the memento to Director (R) The IPR team that conducted the inaugural proceedings.



(L) Mr. Silel Shah receiving prizes for the slogan competition. (R) Members of the local organizing committee of the 33rd DAE Safety & Occupational Health Professionals Meet.

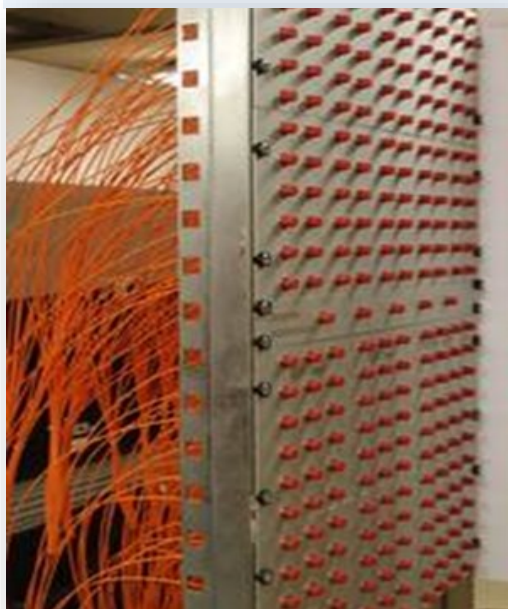
The XXXI Annual meeting of the Indian Association of Physics Teachers (IAPT) was organised at Sh. Maneklal M Patel Institute of Sciences and Research, Kadi Sarva Vishwavidyalaya, Gandhinagar from 20-22 October 2016 by Prof. Rajmal Jain. The event was sponsored by IPR, GUJCOST, SERB, and DST. Several renowned professors (Prof. H.C Verma, Prof. S. P Pandya) attended the event. Dr. Mukesh Ranjan, Dr. G. Ravi and Dr. S. Mukherjee gave the invited talks on various plasma based technologies and research possibilities



Dr. Mukesh Ranjan (L) and Dr. S. Mukherjee (R) delivering their lectures at the IAPT meeting.

IPR-CEA Collaboration

Mr. Kiran Patel has been deputed from Laser Diagnostic Group, IPR for working with Tore-Supra WEST project with Visible Spectroscopy Diagnostic System from 29th May 2016 to 2nd December 2016. He was working with STEP (Service Tokamak Exploitation & Pilotage) group under the guidance of Dr. Oliver MEYER, Mr. Gilles CAULIER, Mr. Benjamin SANTRAINE and CEA coordinator Ms. Nathalie RAVENEL and Dr. Philippe MOREAU. The diagnostic used for measurement of radiance emitted by neutrals and low ionized species at the plasma edge. The system comprises of 240 lines-of-sight viewing the plasma facing components (Divertors, Limiters). He was assigned to develop the data acquisition system for Visible Spectroscopy Diagnostics. He developed spectrometer (SCT 320) and EMCCD camera (ProEM+ 1024 eXcelon) library using C Application Programmable Interface (API). The developed library was then included into WEST libtsdaq and amendment of libtsdaq for windows environment. He also developed the instrumentation control and data acquisition system for camera synchronization with the supervision system, as well as MATLAB code for reconstruction of the image frame from acquired camera.



Left : The optical fiber array for viewing the plasma facing components. Right : The visible spectrometer assembly

The Closest Supermoon Since 1948



The **Supermoon** seen on **November 14, 2016**, was the closest a full moon has been to earth since January 26, 1948. The next time a Full Moon will be as close to earth as this will be on November 25, 2034. A Supermoon is essentially a full or new moon that occurs when the center of the moon is less than 360,000 kilometers from the center of earth. This image of the setting Supermoon was shot in Ahmedabad by Ravi A V Kumar.

Camera : Canon-SX-60 1/80 sec F 6.5; FL 1247mm ; ISO 100



IPR participated in the International Conference on Functional Oxides and Nanomaterials (ICFONM 2016) held at the Saurashtra University, Rajkot during November 11-13, 2016. Dr. N. Ramasubramanian gave a popular talk on 'Plasma and its applications' and Dr. Mukesh Ranjan gave an invited talk on 'Nanopatterning of Semiconductor Oxides and their Applications'.



Dr. Sarveshwar Sharma received the best poster award for his paper entitled "*Driving frequency effect on the electron energy distribution function and electron sheath interaction in capacitive discharges: A simulation study*" at the 6th International Conference on Microelectronics and Plasma Technology (ICMAP 2016) held at Gyeongju, Korea during 26-29 September 2016. This collaborative work was carried out by Dr. Sharma and his collaborators from IPR and Dublin City University, Ireland. This research work has wide applications in the semiconductor industry for manufacturing of integrated circuits.



(L-R) Mr. Rajiv Sharma, Mr. L. N. Gupta and Mr. D. V. Modi making their presentations at the 33rd DAE Safety & Occupational Health Professionals Meet held during 23-25 November 2016.

One-Day Workshop on Plasmas for Societal Benefit

A one day workshop was held on 'Plasmas for Societal Benefit' at FCIPT, IPR on 21st October with an aim to increase awareness of new developments in Plasma Technologies and its benefits to society and various industrial sectors. Dr. Dileep Malvalankar, Director, Indian Institute of Public Health (IIPH) was invited as a chief guest for this event. Participants from various industrial sectors and academic institutes participated in this informative workshop.



Congratulations !

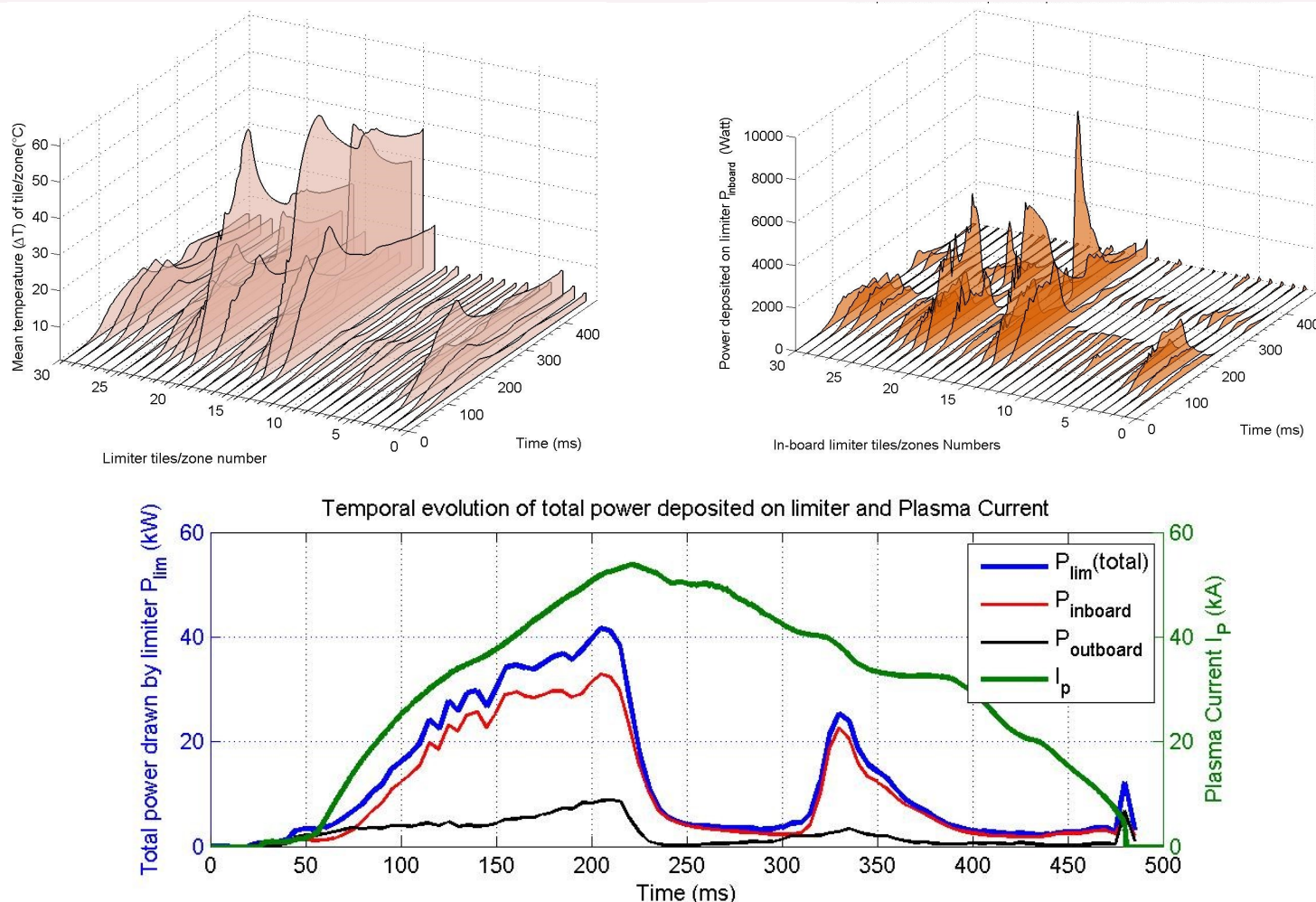


Mr. Govind Lokhande of the Computer Center, IPR has successfully completed the "Lead Auditor" training course for ISMS (Information Security Management System) auditors, based on ISO/IEC 27001:2013. This certification is accredited to NABET (National Accreditation Board for Education and Training) and conducted by IIQM (Indian Institute of Quality Management) Govt. of India.

Mr Lokhande is now eligible to be engaged by NBQP (National Board for Quality Promotion) to perform information management system audits under their direction and management system.



Infrared Thermography of Plasma Facing Components (PFCs, namely Limiter, Divertor, stabilizer plates etc.) is one of the most essential tools to investigate plasma-surface interaction and to estimate power loss through this interaction. The information obtained through this diagnostic is useful for machine protection, plasma control and for physics studies. Statistical analysis of plasma discharges were carried out for various experimental campaign and typical power loss through limiter plasma interaction was estimated as shown in figure. The information was also useful for machine protection, plasma operation & control point of view as well as for physics studies. Statistical analysis showed typical power loss due to limiter-plasma interactions and the results can be useful for power balance studies. The IRT system is deployed on both the tokamaks ADITYA and SST-1.



Figures shows typical temperature evolution plot of the in-board limiter during plasma discharge and corresponding estimated power drawn by the limiter.

3rd PFRC Meeting @ IPR



The 3rd meeting of the Plasma & Fusion Research Committee (PFRC) of the Board of Research in Nuclear Sciences (BRNS) was held at IPR during 26-27 November, 2016.

During this 2 day meeting Chaired by Prof P I John, 14 new R&D projects with a budget allocation of \sim Rs.3.6 Crores as well as 24 ongoing projects were reviewed. The Committee also held deliberations on the future course of R&D in Plasma & Fusion.

(L-R) Dr. N Ramasubramanian, Prof. Prabal Chattopadhyay, Shri. D. K. Dalal (Project Officer, BRNS), Prof. A K Ray, Prof. P I John (Chairman), Shri. P K Atrey, Prof. Sangita (Scientific Secretary, BRNS), Dr. Ravi A V Kumar (Member Secretary, PFRC), Prof. Amit Roy and Prof. T Jayakumar.

- ♦ **Mr. Dushyant Kumar Sharma**, Institute for Plasma Research, Gandhinagar, gave a talk on "Slow Wave Characteristics of Metamaterial Loaded Helical Guide" on 04th November 2016
- ♦ **Mr. Neeraj Chaubey**, Institute for Plasma Research, Gandhinagar, gave a talk on "Synchronization Dynamics Between Two Coupled Glow Discharge Plasma sources" on 04th November 2016
- ♦ **Dr. Mohit P Sharma**, DGFS PhD, HBNI, BARC, Mumbai, gave a talk on "Investigation on the flow distribution within the rod bundle of AHWR" on 08th November 2016
- ♦ **Dr. Vinod Chandra**, Indian Institute of Technology, Gandhinagar, gave a talk on "Exploring the heart of the matter: the hottest and most fluid, liquid in nature at extreme temperature/energy density" on 9th November 2016 (Colloquium #265)
- ♦ **Mr. Chandrasekhar Shukla**, Institute for Plasma Research, Gandhinagar, gave a talk on "Particle-in-Cell Simulations of Fast Electron Time Scale Phenomena" on 16th November 2016
- ♦ **Mr. A.E. Harvey**, Institute for Plasma Research, Gandhinagar, gave a talk on "Constitution of India - Preamble and Important Articles related to Government Employees" on 28th November 2016
- ♦ **Prof. Rajesh Gopakumar**, International Centre for Theoretical Sciences-TIFR, Bangalore, gave a talk on "Down-To-Earth String Theory" on 29th November 2016 (Colloquium #266)

Upcoming Events

- ♦ 31st National Symposium on Plasma Science & Technology will be jointly organized by the Plasma Science Society of India (PSSI) and Bharathiyar University, Coimbatore, 06-09 December 2016 <http://www.pssiplasma2016.in/>
- ♦ IPR-National Science Day (NSD-2017), Institute for Plasma Research, Gandhinagar, 07-08 January 2017 <http://www.ipr.res.in/scienceday2017/index.html>
- ♦ Confronting MHD Theories of Accretion Disks with Observations, Kavli Institute for Theoretical Physics, Santa Bar, United States, 09 January 2017 <https://www.kitp.ucsb.edu/activities/disks17>
- ♦ 7th International Conference on Cloud Computing, Data Science & Engineering (CONFLUENCE-2017), Amity University, Noida, India, 12-13 January 2017 <http://www.amity.edu/aset/confluence2017/>

Know Our Colleagues



Mrs. Manisha K Bhandarkar joined IPR in 1997 with the Aditya Data Acquisition Group and contributed towards the CAMAC & PCI based DAQ systems for different diagnostics. She was also involved in the software development for the AAPS migration from PDP-11 to PCI and VME. Since 1999 she has been working with SST-1 Operation and Control group and actively contributed in the design, development and maintenance of various systems related to SST-1 plasma operation and controls which include Machine monitoring/control system, Timing system, SAN based centralized storage system, GPS based Time Synchronous System, and Web based content management system of SST-1 etc. The working of all these systems has been successfully demonstrated during all of the experimental campaigns of SST-1. She worked at CEA, France, during 2014-2015 under the IPR/IRFM collaboration for the PCS task "Development of interfacing tool between experimental Program Editor (Xedit) & Discharge Control System (DCS)" and CODAC task "Development of Linux driver application for fast FPGA DAQ boards of DHYB (Lower Hybrid Current Drive system) and its interface with TSDaq" for WEST.

Mr. Rajiv Sharma joined IPR in 1997 in the cryogenic division of SST-1 with a masters in Cryogenic Engineering. He significantly contributed in the installation, commissioning and testing of 1.3 kW Helium plant system and its various sub-systems. His major contributions are in the indigenous development of electrical insulation breaks (IB) for LHe and LN₂ services and 4.2 K LHe vapour IB for current feeder system of SST-1 devising components like Indium seal, LN₂ pump and high pressure set-ups. He was in charge of hydro pressure tests for gas vessels, repairing and evacuation of LN₂ transfer lines, PUF and Nitrile insulation in return LN₂ lines, flexibility analysis of cryogenic line and helium leak and thermal shock tests. He independently handled and completed developmental project of electrical breaks under NFP with BRFSST earning 'A' grade and developed GFRP insulation material for high neutron irradiation fluence in KAMINI Reactor. Winner of best poster award in IVS 2012, he also brought laurels from various competitions on safety and Hindi. He is member in various professional societies and a PG Teacher at HBNI and expert member of ITPA Topical Group (India), Diagnostics, ITER I/O. Currently he is working for advancement in different fields of his work.



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