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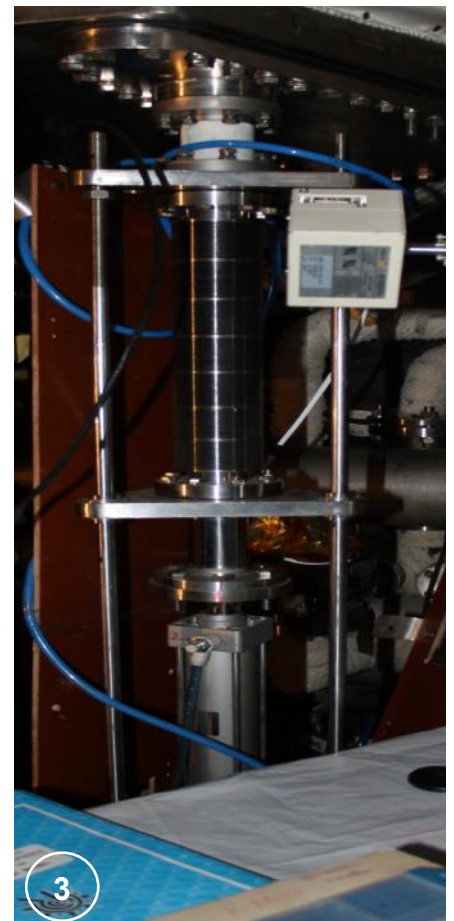
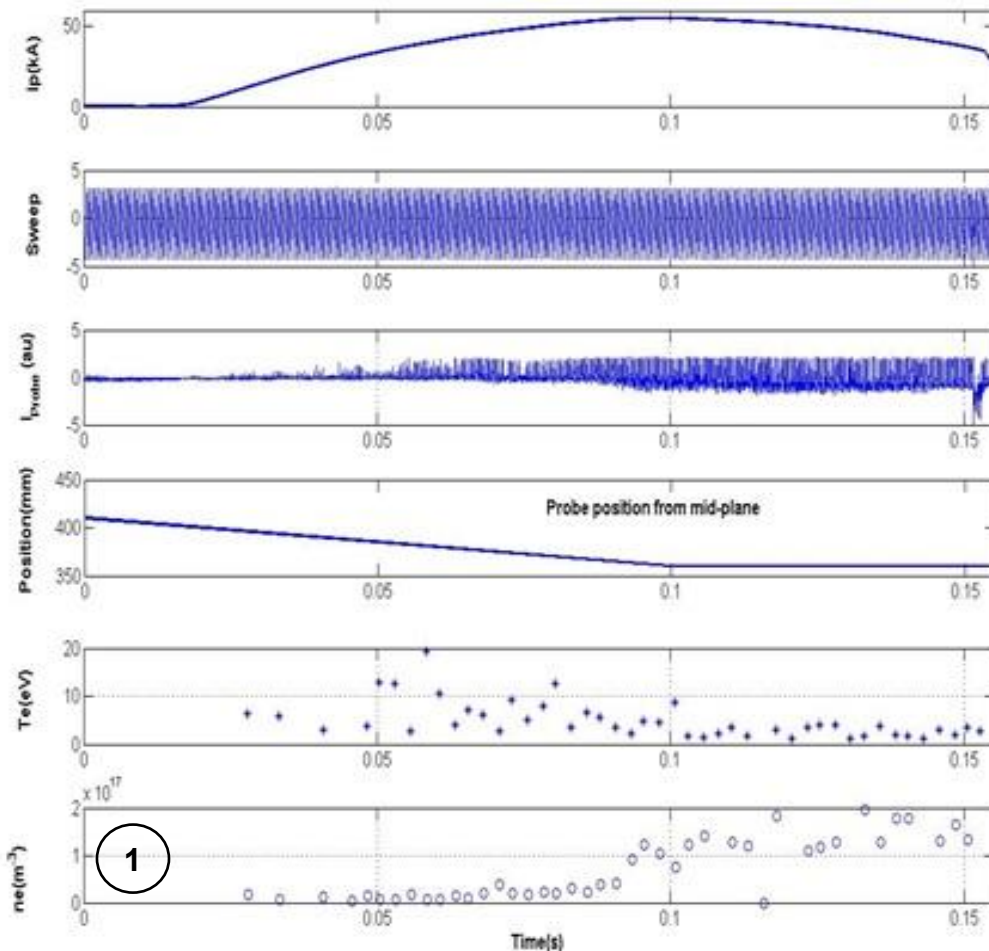
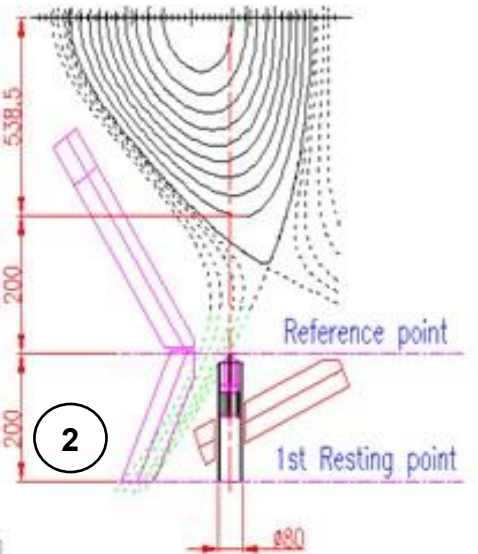
The Fourth State

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

Fast Reciprocating Langmuir Probe (FRLP) Diagnostics

Langmuir probes are standard diagnostics in tokamak to measure the plasma density, temperature, floating potential and plasma flow in the SOL and near X – points of the diverter region. The Reciprocating Langmuir Probe system enables fast measurement of these parameters with a high spatial resolution. The fast reciprocating probe system in SST-1 has multiple tips at one end made from Molybdenum wires of 1 mm diameter and length 3 mm. This probe is designed to scan a length of 200 mm over duration of 200 ms.

The drive system has two step motions, namely a slow motion followed by a fast motion. The slow motion is for moving the probe head from the home position (resting) to the launch position (reference) and the fast reciprocating scan motion is for scanning the probe, starting from the launch position. The movement of the probe tip from home Position to launch Position is facilitated by a pneumatic mechanism, fitted with double acting cylinder. All the operations are realized through a PLC based control with a manual override provision. The double acting cylinders (or air piston) take trigger from the PLC and executes a forward motion with the help of pneumatic valve.



Clockwise (1) Edge density and Temperature measurement for a typical SST-1 shot (2) Poloidal cross-section showing the probe position near x-point (3) The FRLP system mounted at the bottom port of SST-1

On 23rd February, 2018, the lady members of Committee at IPR for Sexual Harassment of Women at Workplace (SHWW), along with Ms. Indu Capoor, (Founder Director of an NGO “CHETNA”), held a meeting with the women staff of IPR/FCIP/ITER-India. This meeting was held mainly to sensitize the women staff on the complaint procedure as well as on their basic rights during complaint redressal and to seek suggestions on prevention of sexual harassment at work at IPR. Excerpts from the ‘Handbook on Sexual Harassment of Women at Workplace Act, 2013’, pertaining to the complaint procedure and rights of the complainant, were highlighted through a brief presentation. Different steps for prevention of sexual harassment were discussed. Members were again assured of confidentiality in dealing with the complaints, if any. They were urged not to keep quiet out of fear or ridicule.



Images from the meeting the women staff of IPR with the IPR Committee for SHWW.

Talks at IPR



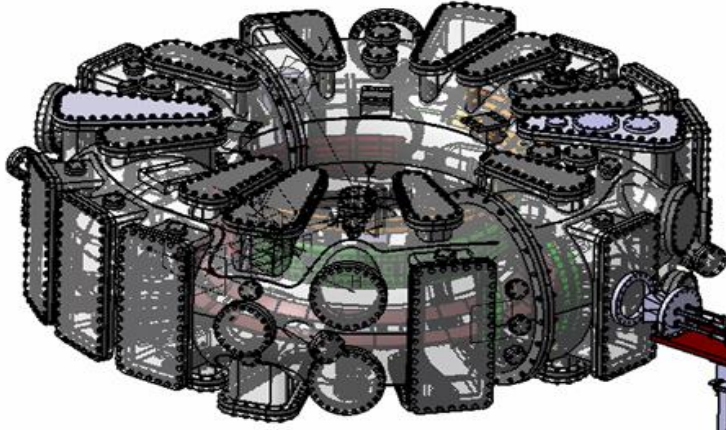
On March 1, 2018, **Dr. Tuong Hoang** of the Institute for Magnetic Fusion Research (IRFM), CEA, Cadarache, France presented an overview on the fusion research activities currently conducted in France, in particular, at IRFM. He highlighted achievements in the ongoing experiments of tokamak WEST. During the talk, he has offered the opportunity of remote participation in analyzing the WEST Tokamak's experimental data. Dr. Hoang is also a member of various advisory committees at CEA and also is involved in the management of international collaborations at IRFM.

Dr. Tuong Hoang

On March 1, 2018, **Professor Rana Adhikari** of the Division of Physics, Mathematics & Astronomy, Caltech, USA delivered a talk on “*Humanity's New Gravitational Sense*”. Prof. Rana is a professor of experimental physics at the California Institute of Technology. He has been working on the goal of gravitational wave detection for the past 20 years, with his focus on the areas of precision measurement which relate to surpassing the fundamental physics limits in order to discover new phenomena related to gravity and quantum mechanics. During the talk, he explained the detection phenomenon of gravitational waves and also how understanding of the quantum physics of the very, very small has allowed us to explore gravitational physics of the very, very large.

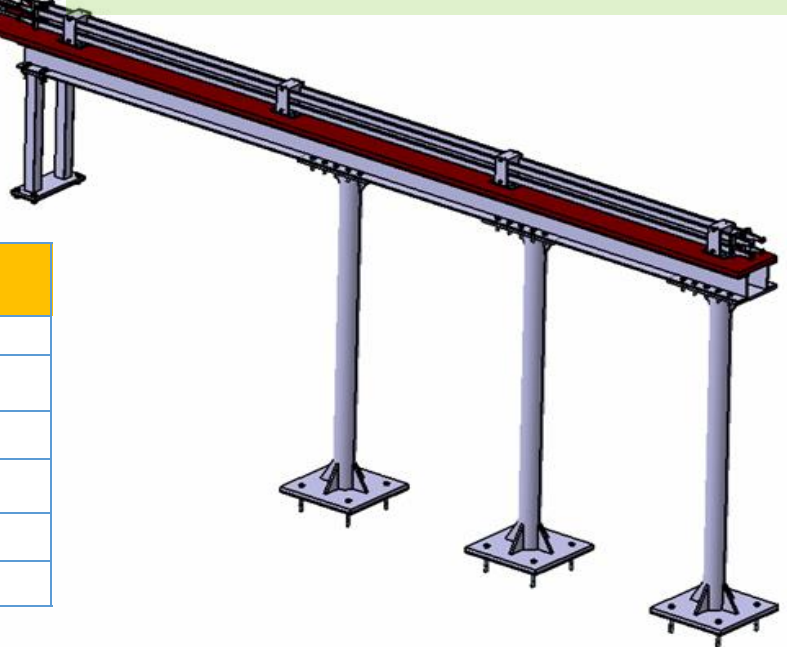
Professor Rana Adhikari





The schematic of the Microwave Reflectometry setup on the Aditya-U Tokamak

RADAR based reflectometry diagnostic is capable of measuring multi point radial density profile of the tokamak plasma in very short time scales of microseconds. It involves a fast, ultra-wide band frequency source from 26 to 40 GHz, an advanced super heterodyne transmitter and receiver along with complex IQ detection along with high speed data acquisition of 200 MSps on the hardware front. The output will be analyzed using advanced signal processing algorithms which leads to unambiguous phase delay detection and subsequent profile generation possible. The entire setup has been developed in-house.



Reflectometer Specifications

Frequency Range	26.5-40 GHz
Plasma Density Range	0.9-1.8 e-19 m ⁻³
IF frequency	200 MHz $\pm$ 25 MHz
Dynamic Range	70 dB
Min. Detectable Signal	-50dBm
Distance Accuracy	$\sim$ 1 cm



Images of the rack mounted microwave electronics as well as the data acquisition system for the reflectometry setup.

IPR and ITER-India participated in the Exhibition that was held as part of the Science Day celebrations at the Giant Meter-wave Radio Telescope (GMRT) at Khodad, Pune on 28 Feb and 1st March 2018. Representing IPR and ITER-India, Dr. Ramasubramanian, Mr. Anil Tyagi and Ms. Yashashri Patil participated in the exhibition, showcasing various technologies developed at IPR as well as India's participation in ITER through posters and videos. Over 20,000 visitors visited the exhibition.



Images from IPR's participation at the Science Exhibition at GMRT, Pune

IPR Participation in the Startup Summit Exhibition 2018 @EDII

IPR participated in the technology exhibition which was organized as part of the Empresario Startup Summit 2018 by the Entrepreneurship Development Institute of India (EDII), Bhat, Gandhinagar on 11th March, 2018. In this exhibition, which was to showcase technology development for possible commercialization, various technologies such as plasma pyrolysis, plasma torch for medical applications, plasma nitriding, high heat flux source, cryo-pump technology etc. were exhibited by IPR using models and posters, which generated a lot of interest amongst the participants of the meeting. The Honorable Union Minister of Commerce and Industry, Shri Suresh Prabhu inaugurated the event.



Date of Visit	Institution	Course undertaken by the visiting students	Number of visitors
09-Feb-2018	Sardar Patel University, Vallabh Vidyanagar	Bachelor and Master of Library and Information Science	Students : 19 Faculty : 02
27-Feb-2018	IIT Roorkee, Roorkee	B.Tech Engineering Physics	Students : 32 Faculty : 02
13-Mar-2018	Indus University, Ahmedabad	B.Tech Electronics & Communication	Students : 70 Faculty : 03
14-Mar-2018	Institute of Infrastructure Technology Research and Management, Ahmedabad	Participants of the National workshop on Recent Trends in Material Processing and Characterization	Visitors : 40
15-Mar-2018	Muktajivan English School, Ahmedabad	XI-XII standard students	Students : 52 Faculty : 02
16-Mar-2018	Bhagwan Mahavir College of Engineering & Technology, Surat	B.Tech Mechanical	Students : 80 Faculty : 04



Students of B.Lib and M.Lib. students from S.P. University, V.V. Nagar during their visit to IPR on 09-02-2018.



Students of B.Tech. Engineering Physics course of IIT Roorkee along with their faculty during their visit to IPR on 27-2-2018.



Students of BE Electronics from Indus University, Ahmedabad during their visit to IPR



Participants of the National workshop on Recent Trends in Material Processing and Characterization during their visit to IPR



Students of Muktaivan English School, Ahmedabad during their visit to IPR

The 47th National Safety Week was celebrated at IPR from 4-10 March 2018. The institute organized various competitions during this week to create safety awareness among its employees. Competitions were organized on Slogan in Hindi & English, Cartoon Making, Quiz and Essay Writing in Hindi & English based on decided topics for the employees of IPR, FCIPT & ITER-India. Encouraging response was received from the employees for various competitions.

Demonstration of use of fire extinguisher was conducted for the employees as well as security staff at IPR during this week. A mock drill on electrocution scenario was conducted for Electrical Power Distribution Section. An awareness program on "Importance and Understanding of Personal Protective Equipment (PPEs)" was conducted by M/s. Honeywell International India Limited. Employees have acquainted themselves during this program by practical demonstration of PPEs.

No.	Competition	1st Prize	2nd Prize	3rd Prize
1	Hindi slogan	Sandhya Dave	Urmil Thaker	Mitesh Patel
2	English slogan	Shirin Bhesania	Shravan Kumar S.	Yashashri Patil
3	Cartoon	Suman Aich	Rakesh Patel	
4	Quiz	Vrushank Mehta	Naveen Rastogi	Pratibha Gupta Atul Garg Dheeraj Sharma
5	Hindi essay	Sandhya Dave	Ritesh Sugandhi	Kanubhai Parmar
6	English essay	Srinivasa M.	Vinit Shukla	



Top : Mr. C. K. Gupta delivering his talk. Bottom : Safety pledge being administered.

In the concluding session that was held on 9th March 2018, Mr. D V Modi welcomed the gathering and a talk on "Safety Procedures and Practices during Electrical Works" by Shri C.K. Gupta. Mr. Ujjwal Baruah, Dean (Admin.) expressed his thoughts on safety and he also administered the "safety oath" to the IPR staff present. A safety quiz for the audience was organized by Mr. Bharat Doshi and Dr. D. Chenna Reddy, Dean (R&D) read out Director's message, which highlighted that everyone is accountable for safety performance and the four 'Cs', i.e., Competence, Control, Co-operation and Communication are very important for a positive safety culture. The prize distribution followed and the vote of thanks was delivered by Mr. Sunil Kumar, the Chairman of the Safety Committee of IPR.

Name of the best safety coordinators	Group/Division
Govind Lokhande	Computer Centre
Rakesh L. Tanna	Aditya Tokamak
Tushar Patel	Plasma Facing Component Division
Yagnesh Trivedi	WC & AC Section
Mehul Chodavadiya	Infrastructure Group, ITER-India



Images from the concluding session of the National Safety Week 2018

Holi, the festival of colours, welcoming the spring season was celebrated at IPR with a lot of joy and enthusiasm during the evening of 1st March 2018. IPR Staff club organized a short, but fun-filled celebration to mark this day. Staff members gathered in IPR lawn and applied natural herbal "*gula*" on each other and exchanged greetings. The celebration ended after tasty snacks were distributed to the staff present.



Adieu...

IPR@Conferences



Professor Ajai Kumar superannuated from IPR on 28th Feb, 2018 after over 33 years of service. After completion of his PhD from PRL, he joined IPR as a Fellow on 1-1-1985 and was responsible for various laser based plasma diagnostics on Aditya and SST -1. He was also actively involved in the laser produced plasma research as well as development of the LVPD system at IPR amongst other activities.

On behalf of IPR, we wish him a happy and healthy retired life !



Dr. Mukesh Ranjan of FCIPT delivered an invited talk entitled "*Nanopatterning by Plasma to detect early formation of abnormalities*" at the 5th International Conference on Nanomaterial and Nanocomposites (ICNN-2018) organized at Vellore Institute of Technology, Chennai Campus during 8-10 February, 2018.

On March 8th, to mark the International Women's Day, a talk and demonstration was organized by the SHWW committee, on Jujutsu (Ju-Jitsu), a Japanese martial art, thought to be highly suitable for women. The techniques of Jujutsu were developed around the principle of using an attacker's energy against him, rather than directly opposing it and it's practitioners learnt that the most efficient methods for neutralizing an enemy took the form of pins, joint locks, and throws.



International
Women's Day

The talk was delivered by Mr Shihan Nazar Soni, President Ju-Jitsu Association, Gujarat and demonstrations were shown by his students. One of these students, Ms Priyanka Rani, is a national champion. Mr Soni also spoke on the need for strength building and nutrition for overall fitness. The talk was attended by the women employees of IPR and questions were asked and answered on issues related to preparedness for attack and self defence strategies.

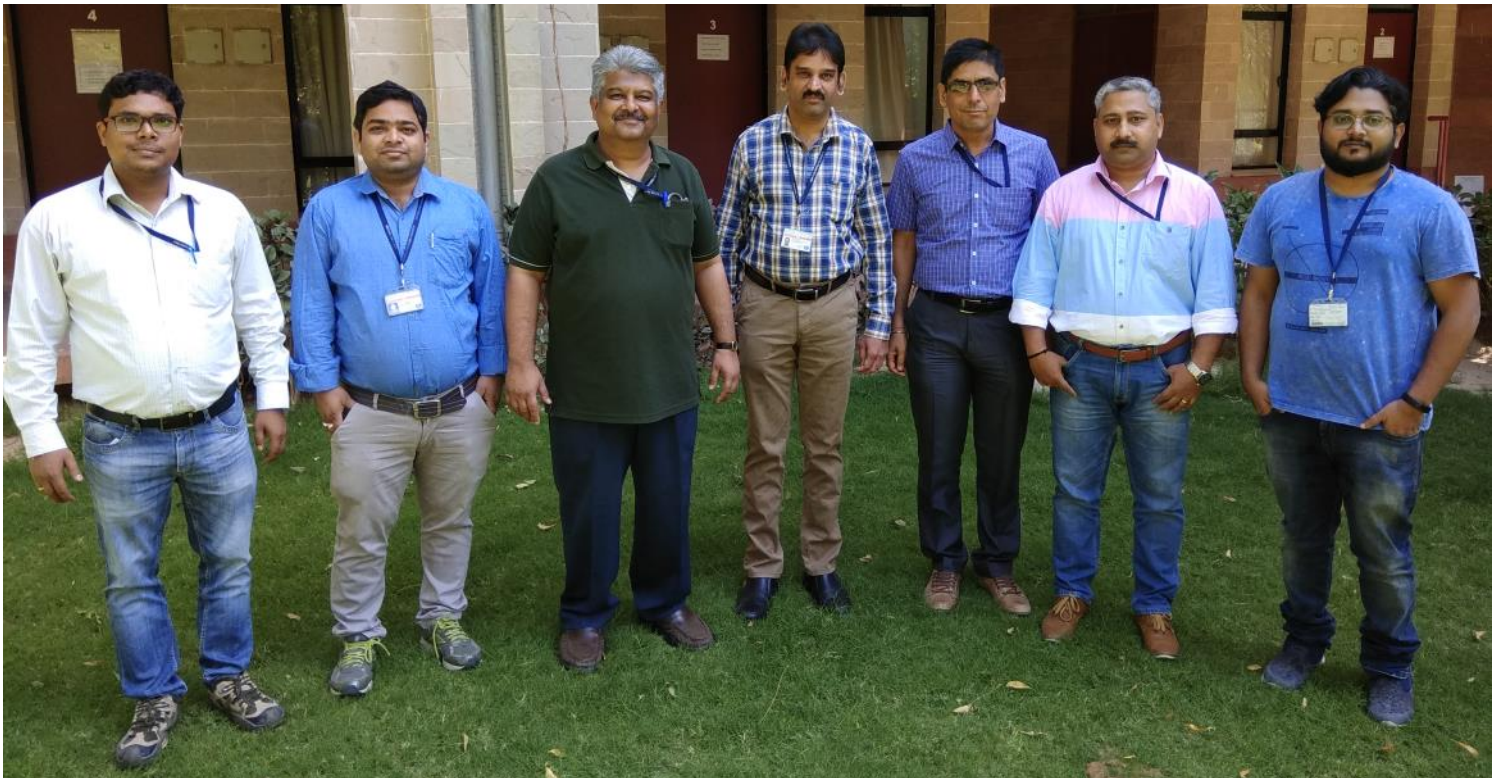


Images from the women's day event at IPR

IPR Groups - LIGO

LIGO division of IPR is responsible for vacuum infrastructure and supervisory data acquisition control & monitoring related to LIGO-India gravitational wave detector. The LIGO-India project which has got in-principle approval by Government of India will be an advanced laser interferometer having a pair of 4x4 km long orthogonally placed hollow cylinder evacuated to $< 10^{-9}$ mbar pressure. Along with IPR, there are other three lead institutions namely DCSEM-Mumbai, RRCAT-Indore and IUCAA-Pune participating in installation and commissioning of the detector on Indian soil.

LIGO-India will be the third detector of its kind, with two earlier successful detectors operating in the United States of America. The location of LIGO-India detector in the Indian subcontinent is important due to the astrophysical significance. LIGO-India detector along with the two detectors in US will form a network of similar detectors and help localize the sources of gravitational waves. Along with source localization, the Indian detector will also help scientists and engineers generate cutting-edge technology and to generate appropriate spin-offs.



The IPR LIGO group. (L To R) : Mr. Rakesh Kumar, Mr. Atul Prajapati, Prof. Subroto Mukherjee, Mr. Amit Kumar Srivastava, Mr. Hitesh Kumar Gulati, Dr. S. Sunil and Mr. Arnab Dasgupta

Swachhta Pakhwada is a fortnight initiative to carry on the agenda of Swachh Bharat Mission to promote cleanliness. With great zeal and enthusiasm, the **Swachhata Pakhwada** campaign was observed at Institute for Plasma Research (IPR) and its all other campus (FCIPT, IPR Extension labs and ITER India) during 16-28 February 2018. During this campaign, all office rooms, laboratories, hostel, canteen, corridors and open spaces in the campus were cleaned and various kinds of waste like paper waste, plastics, metallic waste, scraped cables etc. have been removed and properly disposed off from various places in the campus. **Swachchhata Pakhwada-2018** was concluded with a mass pledge that the campaign and efforts will continue in future to keep our campus clean and green as a part of the “**Swachh Bharat Abhiyan**”. Ms. Chhaya Chavda gave a presentation on installation of bio-gas system. At the end of the program, best cleaned offices, officers, laboratories were identified and suitably rewarded.



Images from the concluding session of the “Swachhta Pakhwada 2018”

- ♦ **Dr. Amit Kumar Rana**, Indian Institute of Technology Indore, gave a talk on "Controlled Growth of Zinc Oxide Nanostructures For Multifunctional Applications" on 26th February 2018
- ♦ **Dr. Prabhakara Rao Y.P. and Dr Vijaya Raghavan**, Indian Institute of Science, Bengaluru, gave a talk on "National Nanofabrication Centre: Facilities and collaboration opportunities" on 26th February 2018
- ♦ **Prof. Rana Adhikari**, California Institute of Technology, gave a talk on "Humanity's New Gravitational Sense" on 1st March 2018 (Colloquium # 286)
- ♦ **Dr. Tuong Hoang**, Institute for Magnetic Fusion Research, France, gave a talk on "The Magnetic Fusion Research Program in France. Current status of the WEST Project" on 1st March 2018
- ♦ **Dr. Rahul Saini**, Indian Institute of Technology Roorkee, gave a talk on "A novel approach for processing waste printed circuit Boards" on 9th March 2018
- ♦ **Mr. Ritesh Sugandhi**, Institute for Plasma Research, Gandhinagar, gave a talk on "Investigation of Particle swarm optimization technique for multidisciplinary problems" on 13th March 2018
- ♦ **Dr. Manoj Kumar Gupta**, Engineering Design and Analysis Group, Institute for Plasma Research, Gandhinagar, gave a talk on "Bubble induced vibration by Liquid Nitrogen (LN₂)" on 14th March 2018
- ♦ **Dr. Amreen Ara Hussain**, Indian Institute of Technology Indore, gave a talk on "Next Generation Optoelectronics through Plasma Nanotechnology" on 16th March 2018

Upcoming Events

- ♦ 7th International Workshop on Mechanisms of Vacuum Arcs (MeVArc 2018), Old San Juan, Puerto Rico, United States, 20-24 May 2018 <https://indico.cern.ch/event/680402/>
- ♦ 9th International Particle Accelerator Conference (IPAC'18), Vancouver, British Columbia, Canada, 20-25 May 2018 <https://ipac18.org/>
- ♦ 15th Dusty Plasma Workshop, Baltimore, MD, USA, 29 May to 1 June 2018 <https://wpdp.umbc.edu/program/>

Know Our Colleagues



Mr. Prashant Thankey joined the Institute in 1999 and was initially involved in plasma nitriding activities at FCIPT. In 2000 he was assigned to the erstwhile 'SST-1 Vacuum Division'. He contributed significantly in testing, installation, commissioning, routine operation and maintenance of vacuum system of SST-1 and its various components. He made important contributions in leak testing of vacuum system of SST-1 and various components like pumping lines, superconducting magnets, electrical isolators, cryogenic lines and circuits, thermal shields, baking channels, plasma facing components and many more. Apart from his 18 years of vast experience in leak testing, he holds a NDT Level II Certificate in Helium Leak Testing and has met the requirements of ASNT recommended practice no. SNT-TC-1A in NDT, Method LT. He has carried out measurements of outgassing rates of various materials intended for use in vacuum system of SST-1. He has also involved in procurement of various vacuum equipment and related systems. Since 2017 he is a member of the 'Vacuum Engineering Services Division' of IPR and some of his present activities also include experiments aimed at studies of ECR discharge cleaning, its possible applications in SST-1 and the development of spherical ionization gauge.

Mr. Pathan Firozkhan joined the Institute in 2000 after completing his B.Sc. (Instrumentation) from M.S. University, Baroda, Gujarat. He completed his Master's degrees (Electronic Science) in 2009 from Annamalai University, Tamilnadu. He is presently with the VESD group, the earlier SST-1 Vacuum Group, as Scientific Officer. He was actively involved in the installation and commissioning of SST-1 Tokamak for vacuum related qualification tests, right from components level. His other major contribution was in the development of SST-1 Vacuum Pumping System. In 2006, he was given the responsibility of SST-1 Vacuum Vessel and PFC baking system. He carried out commissioning of baking system and brought the system to working stage. Also, he successfully carried out PLC based automation and Blowers up-gradation of the system. He took lead in carrying out the high temperature qualification tests for SST-1 Vessel Sectors and Modules before installation. In 2014, He went to D-III-D Tokamak, San Diego, USA for 10 months, where he contributed in up-gradation of FGIS (Fast Gas Injection System). His fields of specialization are Vacuum system development, process automation and microcontroller programming.



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