Issue 076

November 2019

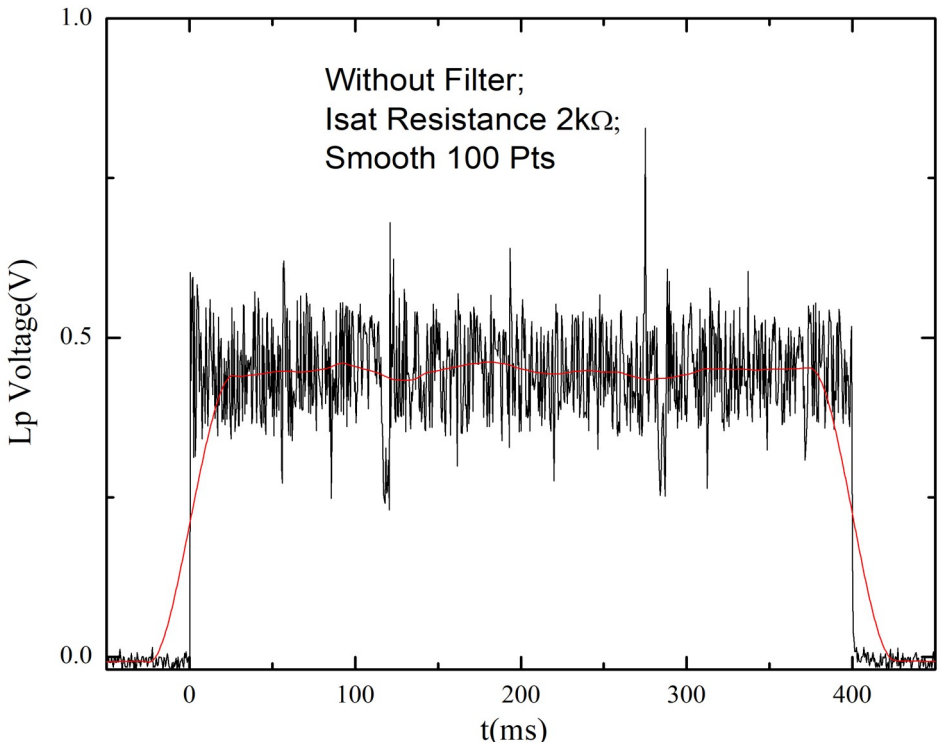
The Four th State

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

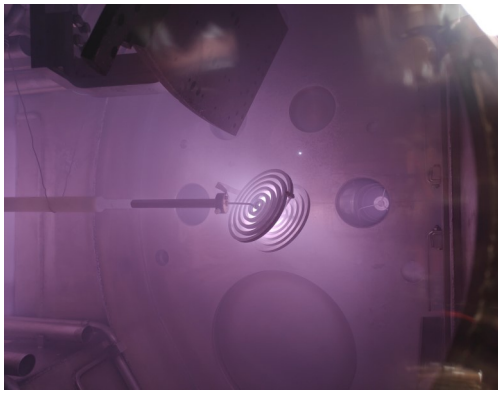
Prototype Development of an Alternative Pre-Ionization Source for SST-1

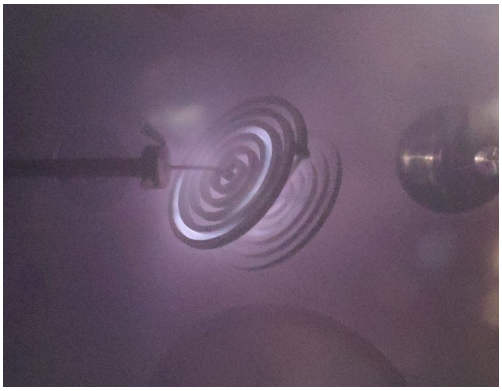
In superconducting tokamaks, ECR is considered to be a very efficient pre-ionization source, and hence requires 100% availability during the experiments. In SST-1, pre-ionization is assisted by a 42GHz Electron Cyclotron Resonance (ECR) system. Since SST-1 does not have any other source for pre-ionization, a prototype two spiral antenna assembly has been developed as an alternative source.

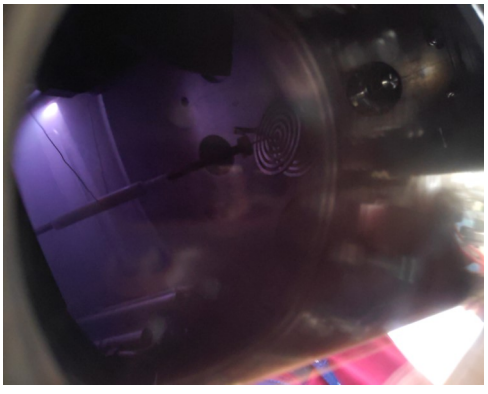
The antenna system has been installed in SST-1 1/8th section, located at the MEL and tested with various frequencies (with no magnetic field). Plasma discharges have been obtained at various frequencies, such as 60MHz, 260MHz, 403 MHz and its characteristics are being studied. Plasma discharges were produced inside the SST-1 1/8th section, having a filling pressure of 7.5×10^{-3} mbar with forward RF power at 850W, 100W and 100W for the frequencies of 60MHz, 260MHz and 403MHz respectively. Plasma density was measured by Langmuir Probe and it was computed to be around ~ $8.4\times10^{15}/m^3$.



(L) Prototype spiral antenna installed at the 1/8th of SST-1 section (R) Langmuir probe data using this antenna system







The antenna assembly being tested at (L) 60 MHz, 850W (M) 260 MHz, 100W and (R) 403 MHz, 100W

प्लाज़्मा अनुसंधान संस्थान में नराकास, गांधीनगर की 13वीं छमाही बैठक का आयोजन

नगर राजभाषा कार्यान्वयन समिति, गांधीनगर की 13वीं छमाही बैठक दिनांक 16 अक्टूबर, 2019 को प्लाज़्मा अनुसंधान संस्थान के सेमिनार हॉल में आयोजित की गई। बैठक के आरंभ में मंचासीन अतिथियों द्वारा दीप प्रज्जवलित किया गया। प्लाज़्मा अनुसंधान के निदेशक डॉ.शशांक चतुर्वेदी ने डॉ. सुस्मिता भट्टाचार्य, उप निदेशक (कार्यान्वयन)- राजभाषा विभाग, गृह मंत्रालय, क्षेत्रीय कार्यान्वयन कार्यालय-मुंबई, श्री पंकज एम जानी, अध्यक्ष नराकास एवं प्रमुख बड़ौदा एपेक्स अकादमी, गांधीनगर, श्रीमती पारुल मशर- सहायक महाप्रबंधक (राजभाषा), प्रधान कार्यालय, बड़ौदा एवं श्री पुनित कुमार मिश्रा, सहायक महाप्रबंधक (राजभाषा), प्रधान कार्यालय, बड़ौदा को भेंट के रूप में पुस्तक प्रदान कर स्वागत किया। इस अवसर पर नराकास गांधीनगर में स्थित केन्द्र सरकारी कार्यालयों/बैंकों के प्रमुख, प्रतिनिधि, राजभाषा अधिकारी एवं हिंदी प्रभारी उपस्थित थे।

इस बैठक में डॉ.शशांक चतुर्वेदी, निदेशक, आईपीआर एवं अध्यक्ष, राजभाषा कार्यान्वयन समिति ने सभी अतिथियों का स्वागत किया और आईपीआर की वैज्ञानिक एवं राजभाषा संबंधी गतिविधियों का संक्षिप्त परिचय दिया। सदस्य-सचिव के रूप में श्री अमित कुमार चौधरी, बड़ौदा एपेक्स अकादमी ने बैठक की कार्यवाही शुरू की। डॉ. सुस्मिता भट्टाचार्य ने पिछली छमाही हिंदी प्रगति रिपोर्ट की समीक्षा के आधार पर राजभाषा के कार्यान्वयन में हो रही कमी को दूर करने हेतु आवश्यक निर्देश दिये।
नराकास, गांधीनगर की हिंदी पत्रिका के लोकार्पण के पश्चात् नराकास, गांधीनगर के सदस्य कार्यालयों द्वारा आयोजित प्रतियोगिताओं के विजेताओं को पुरस्कृत किया गया। प्लाज़्मा अनुसंधान संस्थान के इन कर्मचारियों ने विभिन्न प्रतियोगिताओं में पुरस्कार प्राप्त किया हैं-

- मुख्यालय तटरक्षक क्षेत्र द्वारा 10 जुलाई 2019 को आयोजित हिन्दी आशुभाषण प्रतियोगिता के लिए सुश्री हिरल जोशी को द्वितीय पुरस्कार प्रदान किया गया।
- प्लाज़्मा अनुसंधान संस्थान द्वारा 06 अगस्त 2019 को आयोजित ऑनलाइन वर्ग पहेली प्रतियोगिता के लिए सुश्री ज्योति अगरवाल को द्वितीय पुरस्कार प्रदान किया गया।
- केन्द्रीय विद्यालय संगठन द्वारा 25 सितम्बर 2019 को आयोजित कविता प्रतियोगिता के लिए श्री कौशलेंद्र सिंह, को द्वितीय पुरस्कार प्रदान किया गया।
- मुख्यालय तटरक्षक क्षेत्र द्वारा 27 सितम्बर 2019 को आयोजित राजभाषा नीति हिन्दी प्रश्नोत्तरी प्रतियोगिता के लिए श्री अनुज कुमार गर्ग को प्रथम एवं श्री रजनीकांत भटासना को प्रोत्साहन पुरस्कार प्रदान किया गया।

दीप प्रज्जवलित करते हुए बड़ौदा एपेक्स अकादमी के प्रमुख एवं नराकास, गांधीनगर के अध्यक्ष श्री पंकज एम.जानी

सभी अतिथियों का स्वागत करते हुए डॉ. शशांक चतुर्वेदी

प्लाज़्मा अनुसंधान संस्थान में नराकास, गांधीनगर की 13वीं छमाही बैठक का आयोजन.....

(L) नरकास अध्यक्ष एवं बड़ौदा एपेक्स अकादमी के प्रमुख श्री पंकज एम जानी द्वारा प्रथम पुरस्कार प्राप्त करते हुए अनुज कुमार गर्ग
(R) वर्ग पहेली प्रतियोगिता के लिए आईपीआर के निदेशक द्वारा द्वितीय पुरस्कार ग्रहण करते हुए श्रीमती ज्योति अगरवाल

(L) कविता प्रतियोगिता हेतु केन्द्रिय विद्यालय संगठन, गांधीनगर के प्रमुख द्वारा पुरस्कार प्राप्त करते हुए श्री कौशलेन्द्र सिंह
(R) आशुभाषण प्रतियोगिता के लिए मुख्यालय तटरक्षक क्षेत्र, गांधीनगर के प्रधान द्वारा द्वितीय पुरस्कार प्राप्त करते हुए श्रीमती हिरल जोशी

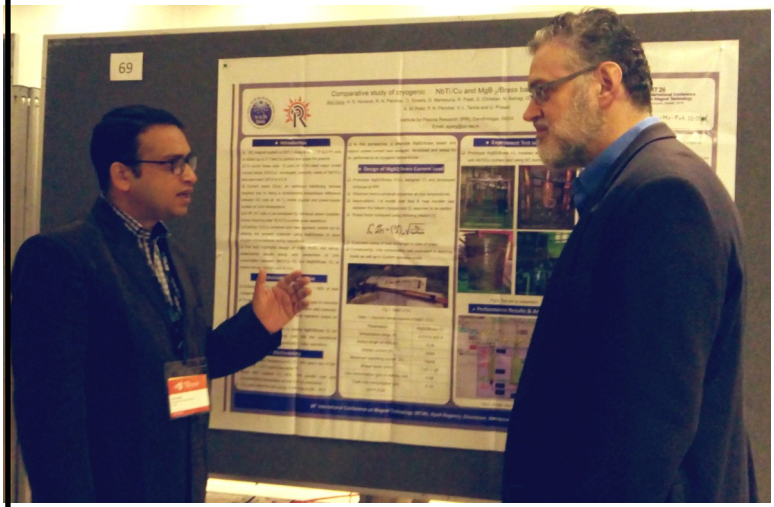
बैठक में उपस्थित नराकास, गांधीनगर के सदस्य कार्यालयों के प्रमुख एवं प्रतिनिधि

Swachhata Abhiyan @ CPP-IPR

As a part of the '*Swachhta Hi Seva Campaign',* the employees of CPP-IPR participated in a cleanliness drive on 1st October, 2019. The employees cleaned the areas around the approach road of the institute from the Nazirakhat LP School to CPP-IPR gate. The employees also cleaned the campus.

IPR @ Conferences

Mr. Atul Garg (SO-D), of the SST-1 Cryo division presented a poster entitled "*Comparative study of cryogenic Nb-Ti/Cu and MgB2/Brass based current leads*" at the MT26, International conference on Magnet Technology, held at Vancouver, Canada during 22-27 September 2019.

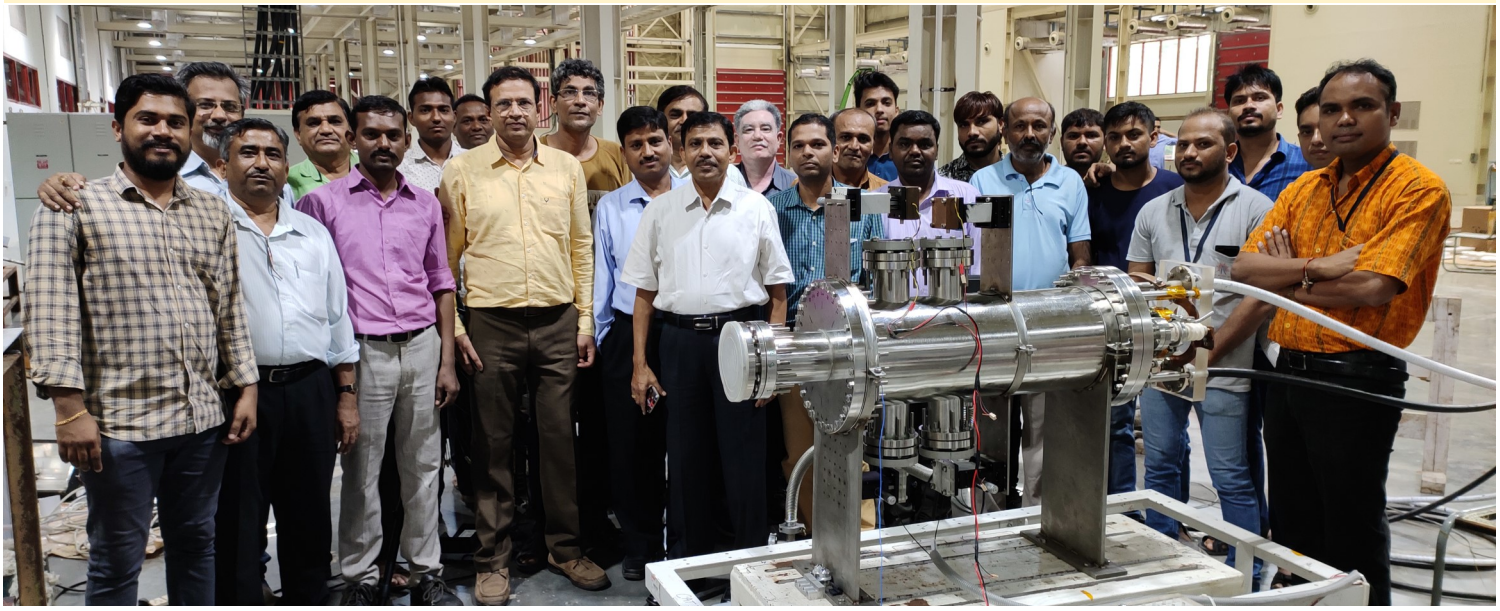


Dr. Mukesh Ranjan had given a presentation on "Plasma Technologies for sensing applications" at UGC-DAE Consortium for Scientific Research, Indore on 29/09/2019.

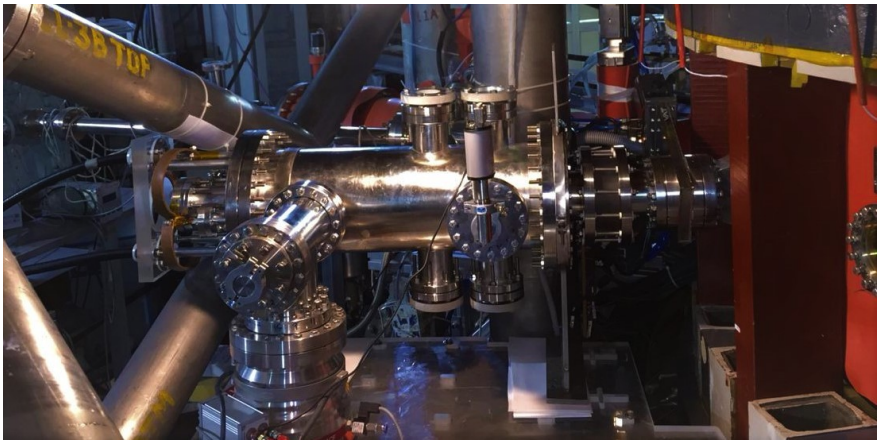
Commissioning of Inductive Pellet Injector (IPI) on ADITYA-U

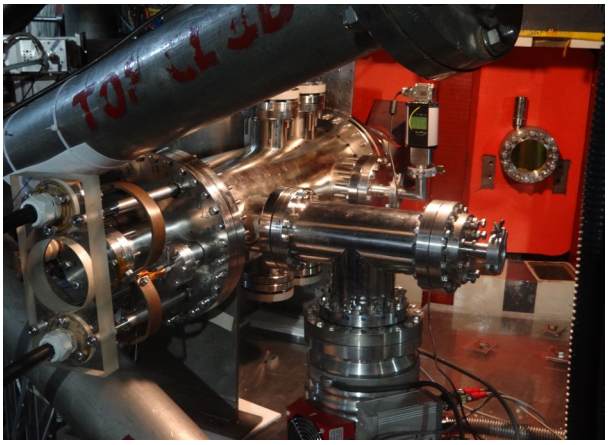
The final commissioning of a novel Inductive Pellet Injector (IPI) on ADITYA-U was completed on 24th Oct, 2019. Such a vacuum compatible electromagnetic injector is first of its kind and can inject solid pellets at a velocity of 200m/s into the plasma. It will be used to carry out Experiments on Disruption Mitigation and Runaway electron Suppression in ADITYA-U. All the tests before mounting and commissioning, including high voltage testing (up to 6 kV), vacuum testing (2x10-7 Torr), mechanical alignment, cartridge rupture and Pellet Ejection were successfully demonstrated in a 5-month, time-bound effort.

The development was carried out jointly by a team from CAD, BARC-Vishakapatanam led by Dr. Sambaran Pahari and a team from IPR (comprising of staff from MESD, Vacuum, RF and ADITYA-U) led by Shri. Bharat Doshi. The commissioning of the system was graced by Prof. Abhijit Sen, Dr. Chenna Reddy, Prof. Sudip Sengupta, Prof Prabal Chattopadhyay, Dr. Joydeep Ghosh in presence of ADITYA-U and BARC Vizag team members and other staff members of IPR.

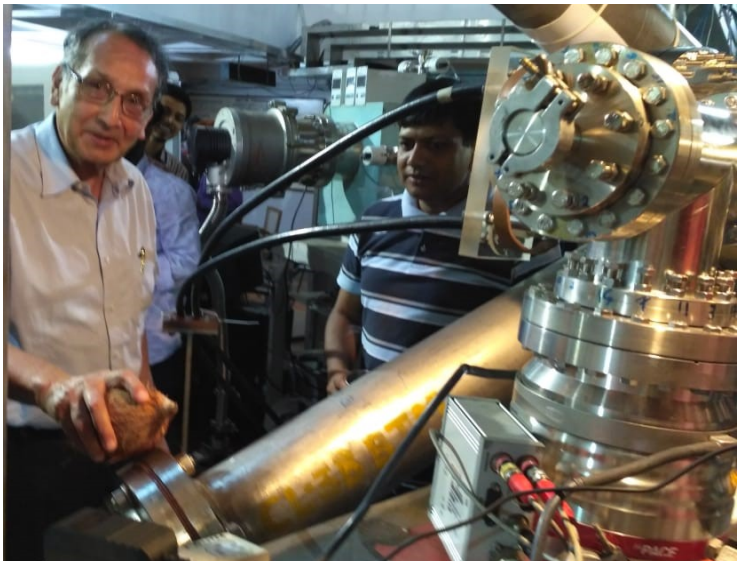


The team members from IPR and BARC Vizag along with the Inductive Pellet Injector, ready for Commissioning on A-U





Views of the Inductive Pellet Injector installed on Aditya-U



(L) Formal commissioning of the IPI (R) The commissioning team from BARC Visakhapatnam

"Swachhta Hi Seva" (SHS) Campaign-2019 @ IPR

"Swachhta Hi Seva (SHS) Campaign, 2019 was observed at IPR and its different campuses during 11th September to 2nd October 2019 with great zeal and enthusiasm. This initiative is a program of the Government of India to promote cleanliness. As part of this drive, IPR staff were motivated to clean their offices and laboratory spaces and also clear away plastic and other unwanted materials. All employees of IPR were effectively involved in mass cleaning activities during this campaign.

Extensive drive has been done for cleaning of all the offices, laboratories, canteens, guest houses, kitchens, and lavatories for the removal of unwanted items (plastic, paper, metal, non-metal, and different other waste). Various posters, banners, slogans were displayed on notice boards and in various other location of IPR, showing importance of cleanliness during this campaign. A seminar on "Swachhata Hi Seva (SHS) Campaign - 2019" also has been conducted at IPR. Several action plans also have been undertaken to continue this Swachhta Hi Seva (SHS) Campaign, 2019.

IPR @ Conferences

Dr. Paritosh Chaudhuri gave a presentation entitled "Status and progress on the activities of lithium ceramic breeder materials at IPR" at the "International Workshop on Ceramic Breeder Blanket Interactions (CBBI-20)" at KIT, Germany, during 18 - 20 Sept. 2019.

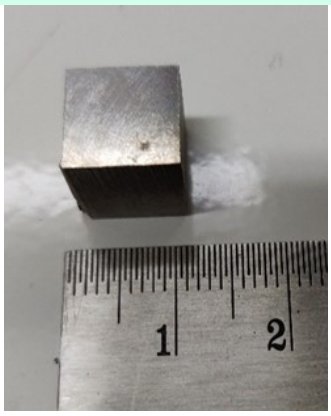
IPR @ Vikram Sarabhai Centenary Celebrations @ Mumbai

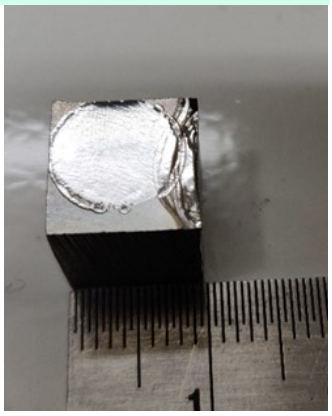
IPR participated in the Dr. Vikram Sarabhai Centenary programme organized by DAE at the DAE Convention Centre, Anushakti Nagar, Mumbai on 17-18 October, 2019. IPR exhibited technologies related to industrial and societal applications of plasma at the exhibition organized in the sidelines of this event. Dr. K. Kasturirengan, former Chairman ISRO visited the IPR pavilion and interacted with IPR staff present there. The exhibition was also part of the “Children's’ Fest” which was organized on 18th October 2019.

Electro Polishing and Etching Facility @ IPR

A state-of-the-art electro-polishing and Etching machine was procured and installed in the High Temperature Technologies Division (HTTD) at IPR. **Electrolytic polishing** or **electro-polishing**, is widely used in the metallography of specimens such as stainless steels, copper alloys, tungsten and tungsten alloys, and other metals. Electrolytic polishing can completely remove all traces of worked metal (micron level) remaining from mechanical grinding and polishing operations used in specimen preparation.

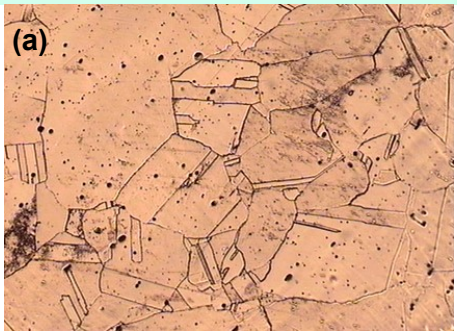
Electro-etching or **Etching** is used in metallography, primarily to reveal the microstructure of a specimen under the optical (light) microscope. A specimen suitable for etching must include a carefully polished plane area of the material free of changes caused by surface deformation, flowed materials and scratches.

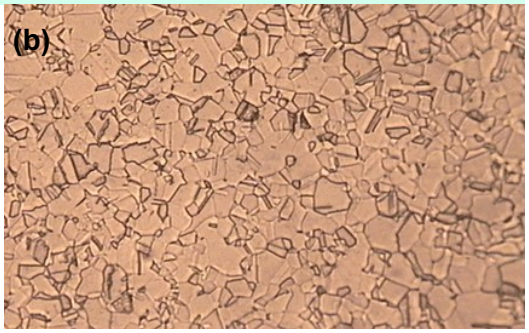




(L) The Electro Polishing and Etching Machine (R) SS316L sample before and after electro polishing

The electro-polishing is carried out using an electrolyte of 80% ethanol and 20% perchloric acid, with operational parameters of 25V, an exposure time of 20 sec and 75% flow of the electrolyte. Electro-etching is carried out using an electrolyte consisting of 10% oxalic acid and 90% water, with operating parameters of 6 volts, 30 sec exposure time and 80% electrolyte flow.

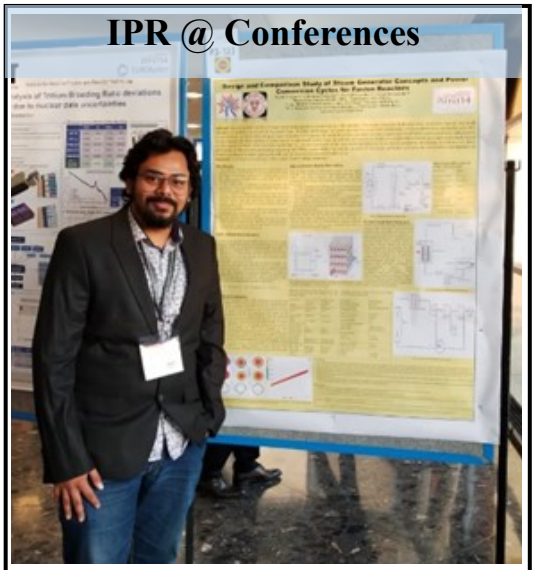


(L) SS304 sample (as received + electro polishing) (R) Microstructure analysis done using Optical Microscope at 100X magnification for (a) SS316L sample (b) SS304 sample

International Award For Former IPR Research Scholar

Former research scholar of IPR, **Dr. Rupak Mukherjee** received the 2019 PPPL under 30 Scientist and Student Award, in recognition of his exceptional contribution to plasma physics at the start of his career. He has been a post-doctoral fellow at the Princeton Plasma Physics Laboratory (PPPL) since June 2019. The award was given based on his thesis work and publications in areas that describe the evolution of non-linear plasma flows. Dr. Mukherjee worked under Dr. Rajaraman Ganesh for his PhD at IPR. The award of $300 cash and a certificate and citation will be presented to him at the AAPPS-DPP Conference in Hefei, China, in November 2019. News / Photo courtesy PPPL

IPR @ Conferences



Mr. Piyush Prajapati presented poster entitled *"Design and Comparison Study of Steam Generator Concepts and Power Conversion Cycles for Fusion Reactors"* at the14th International Symposium on Fusion Nuclear Technology (ISFNT), held at Budapest during 22-27 Sep 2019.

Outreach : IPR Visits

Educational Visits to IPR/FCIPT – Sept-Oct 2019		
Name Of the Institution	**Date**	**Number of visitors**
National Institute of Design, Gandhinagar	26th Sept 2019	15 MDES students and two faculties
Shree Swami Atmanand Saraswati Institute of Technology, Varaccha, Surat	9th Oct, 2019	62 Electronics and Communication engineering students and faculties
Government Engineering College, Gandhinagar	9th Oct, 2019	33 BE Metallurgy students and two faculties
Delhi Public School, Bopal, Ahmedabad	23rd Oct, 2019	49 students of 12th grade Science and two faculties

Students from National Institute of Design, Gandhinagar, during their visit to FCIPT

Students from Shree Swami Atmanand Saraswati Institute of Technology, Surat, during their visit to IPR

Past Events @ IPR

- ***Dr. Ashish Adak,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Solitons and shock wave in magnetized pair-ion plasmas" on 20th September 2019
- ***Dr. Santanu Banerjee,*** Department of Physics, William & Mary, Williamsburg, USA, gave a talk on "Effect of on-axis ECRH on ELM dynamics and pedestal behavior in DIII-D" on 25th September 2019
- ***Dr. Saikat Ghosh,*** Indian Institute of Technology, Kanpur, gave a talk on "Nonlinear dynamics of atomically thin graphene oscillators" on 27th September 2019
- ***Mr. Jinto Thomas,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Study of laser produced plasma plume and its dynamics in nickel thin film" on 09th October 2019
- ***Mr. Gaurav Kumar Singh,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Study of two phase flows in fusion magnets" on 11th October 2019
- ***Mr. Sagar Sekhar Mahalik,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Molecular Dynamics Simulation Study of Resonance Absorption Phenomena in Intense Laser-Driven Atomic Nano-Clusters" on 11th October 2019
- ***Mr. Jay K Joshi,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Inferring the magnetization effects on a CCRF plasma discharge – An Electrical Approach" on 14th October 2019
- ***Dr. Aniruddha Samanta,*** FCIPT, IPR, Gandhinagar, gave a talk on "Testing & optimization of plasma treated Ti6Al4V for the development of hip femur head and dental crown" on 18th October 2019
- ***Mr. Arunsinh B. Zala,*** Institute for Plasma Research, Gandhinagar, gave a talk on "Investigations on Weldability

Upcoming Events

- Materials Research Society (MRS) 2019 Fall Meeting and Exhibit, Boston, Massachusetts, USA, 1-6 December 2019
- SERB School on Nonlinear Dynamics, IIT Patna, 03-30 December 2019
- 34th National Symposium on Plasma Science & Technology, VIT Chennai, Chennai, 3-6 December 2019
- 11th Asia-Pacific International Symposium on the Basics & Applications of Plasma Technology (APSPT-11), Kanazawa, Japan, 11-14 Dec 2019
- 12th Asia Plasma and Fusion Association Conference, Shenzhen, China, 11-13 Dec 2019
- National conference on Cryogenics for Space, LPSC/ISRO, Thiruvananthapuram, 12-14 Dec 2019

Know Our Colleagues

Nilesh S Contractor, joined as Laboratory Assistant in March 2003 with Positive Neutral Beam System. His area of work is fabrication and fitting work in Neutral beam injector systems and erection of Liquid Helium Plant, Performed MLI wrapping in all connection of LHe and LN2 transfer lines inside vacuum vessel and in cryo plant. He has participated as volunteer and worked with responsibility for many of the IPR events like annual day, staff club activities and National Science Day celebration events. He is also part time marathon runner and participated 8 half marathon, 2 time ultra-marathon. He is also captain of IPR cricket team twice. He worked as sports secretary for IPR staff club as well. He was awarded for "Lab Area Cleanliness" award as well.

Kalpesh Doshi, from the TTP-4 batch, started his carrier with the Electronics group, working for electronics requirement for diagnostics of the SST-1 and ADITYA. He has worked for Soft X-ray, ECE, Bolometer etc. He had developed 16 channels Analog Signal conditioning circuit of 8 layers PCB with onboard array based sensors for Soft X ray / Bolometer diagnostic. During refurbishment of SST-1 in 2006,he worked as responsible officer for Magnet sensor instrumentation and nano volt measurement for superconducting magnet joints. He participated in TF coil cold test campaign and SST-1 integrated commissioning and initial plasma campaign. In 2014, he was deputed to ITER, France to work as Coil Instrumentation electronics engineer in ITER magnet division. He worked for the development; qualification and procurement of instrumentation components for magnet quench detection measurement chain. At ITER, he had received the ITER Director General "annual cash award" in recognition of his work for four consecutive years. He was also nominated by ITER as an Indian representative member of ITER Ethics committee for three years. He returned to IPR in July 2019 and joined the Fundamental Plasma Experiments Division. His areas of interest are system development in challenging environments involving cryogenic temperature, high vacuum, high voltage, radiation and high magnetic fields. He holds a Masters in Electronics Engineering, from M S University of Baroda.

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**

Institute for Plasma Research
Bhat, Near Indira Bridge
Gandhinagar 382 428,
Gujarat (India)

प्लाज़्मा अनुसंधान संस्थान
Institute for Plasma Research

Web : www.ipr.res.in
E-mail : newsletter@ipr.res.in
Tel : 91-79-2396 2000
Fax : 91-79-2396 2277

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