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The 4th State

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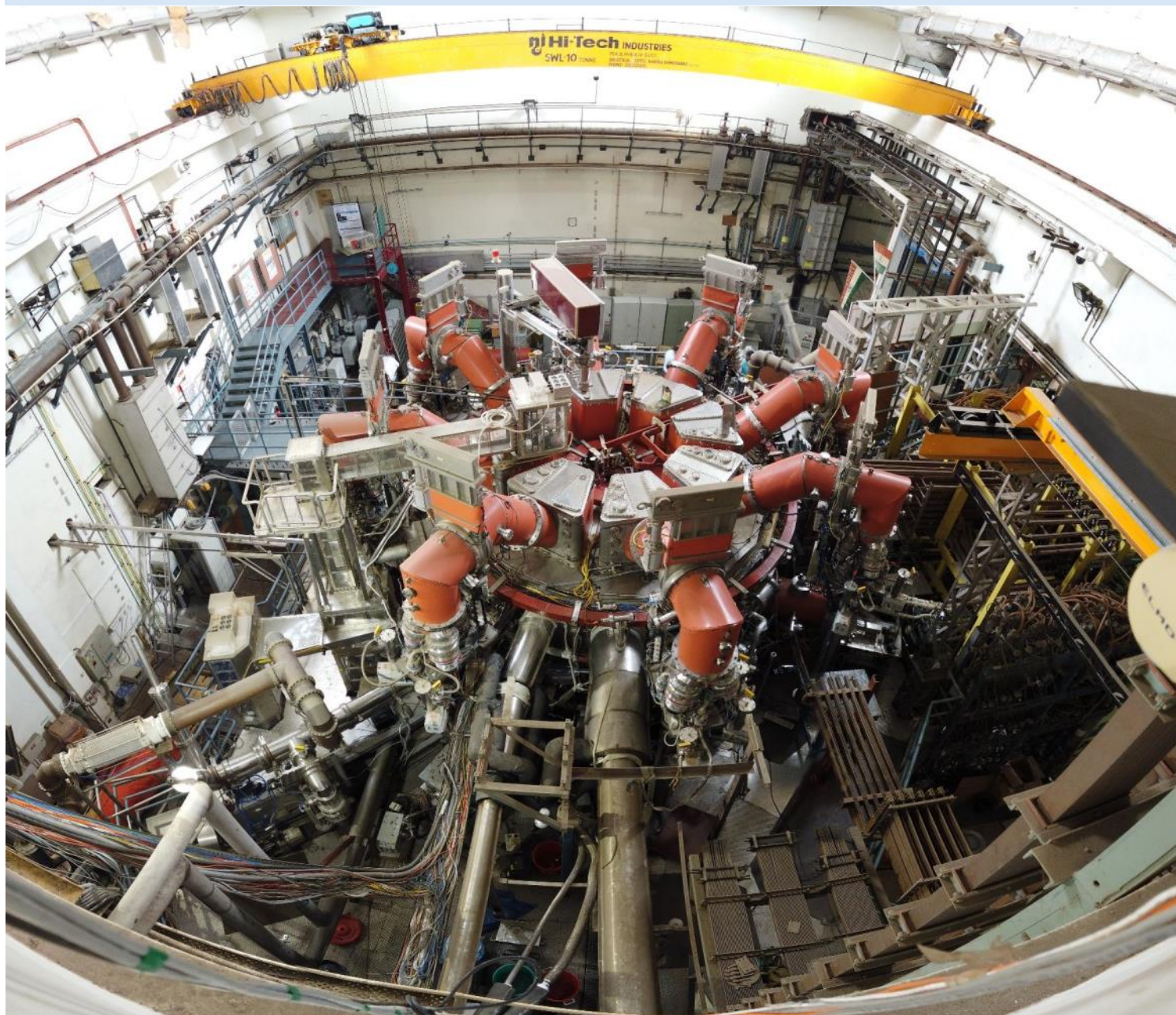


75th
Issue

SST-1 : 25th Experimental Campaign

The 25th experimental campaign of the SST-1 tokamak yielded a record 15 days of plasma shots, yielding 300 plasma shots, covering plasma current in the range 60-92 kA, electron density in the range of $6-9 \times 10^{18} \text{ m}^{-3}$ and temperatures in the range 200-250 eV. This campaign was dedicated to exploring the limits of Ohmically-driven operation in tokamak SST-1. The first achievement was to increase plasma pulse duration beyond the 450 millisecond limit obtained in the 24th campaign with pure ohmic drive -- an enhanced duration of 650 ms with a plasma current of 65 kA was obtained.

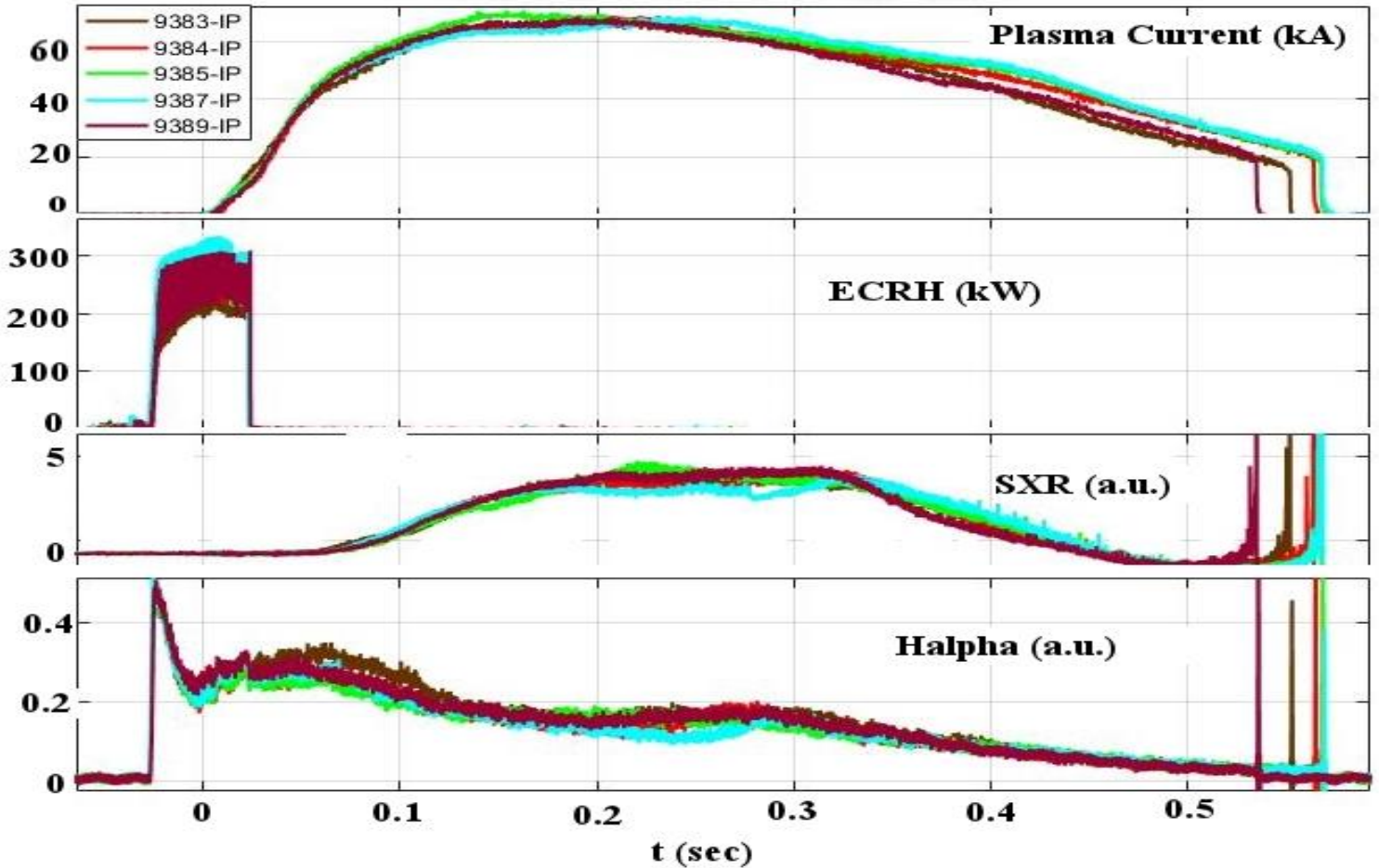
The second achievement was to increase the reproducibility of shots -- Figure 1 shows five nearly identical shots. Thirdly, early in the campaign, it was found that impurity generation from plasma-wall interactions was reducing shot duration and peak current, with impurities likely being generated by ECR-driven plasma production close to the outboard limiter.



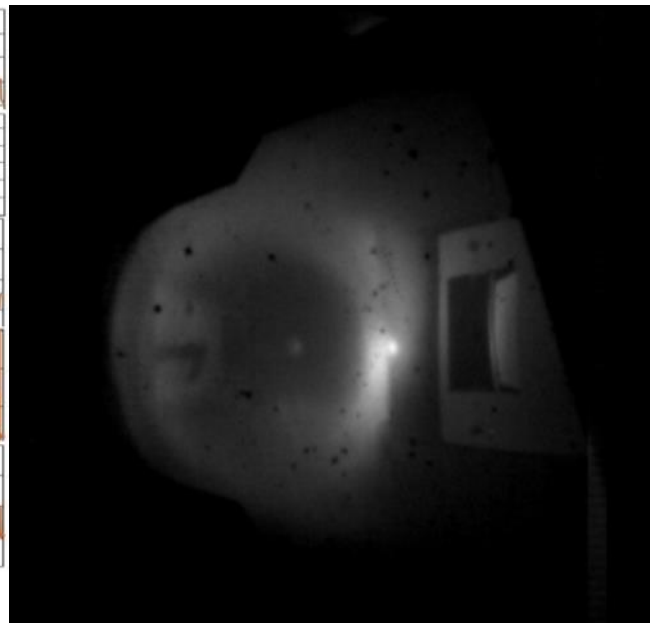
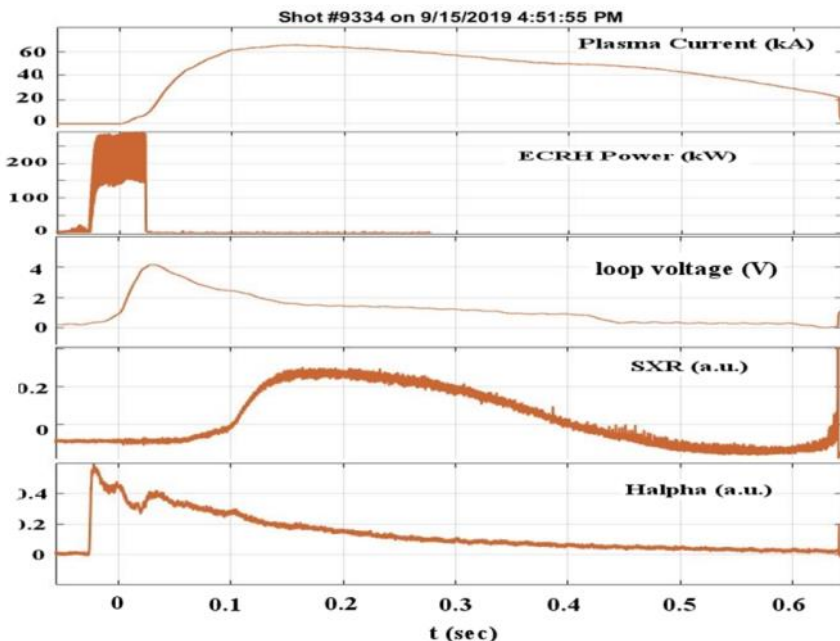
Bird's-eye view of the SST-1 Tokamak

Hence the toroidal field was varied systematically from 1.35-1.6 Tesla, corresponding to ECR resonant layers located at different radial positions -- this has yielded data which will be analyzed for guiding the next campaign. Fourthly, multiple gas puff patterns at various times during the plasma discharge were tried to study their effect on suppression of hard X-rays. Fifthly, initial gas fill pressures were tried over the range 9×10^{-6} - 3×10^{-5} mbar. For the first time, SST-1 was operated with feedback control of plasma radial position. A few shots were tried as a first step, and the proportional gain will be optimized in the next campaign.

Such a long experimental campaign was made possible by stable operation of the superconducting TF coils and optimized operation of the cryoplant. TF coil current flat-top of ~6 hours was demonstrated using vapor-cooled current leads. Cryo-temperatures of 8-9 K were achieved by the simultaneous cool down of the TF coils, PF-3 coil pair and Case. PF-3 coils were held at 6-7 K for more than 24 hours at the same time as superconducting TF coils, and liquid helium production of 40 litres/hour was achieved.



Repeatability of SST-1 shots during the 25th campaign



(L) Parameters of SST-1 shot #9334 (R) Video frame grab of the SST-1 plasma ($T = 200$ ms)

Testing and Installation of High Voltage DC Power Supplies at CPP-IPR

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Two numbers of high voltage DC power supplies (15 kV, 2A) have been procured, tested and installed successfully at Negative Hydrogen Ion Extraction Laboratory (NHIEL), CPP-IPR recently. These will be used for negative hydrogen ion extraction and acceleration experiments. The power supplies are featured with PWM control with over voltage and over current protection with built in arc detector. Additionally, the supplies have also interlock capability for emergency shutdown. All the controls of the power supplies have both local and remote options so that these can be connected to Data Acquisition and Control System. To test these systems at its full capability, a 30kW dummy load had been fabricated indigenously by the NHIEL team at CPP-IPR. Also a spark gap arrangement had been developed in house by that team for wire burn and arc testing. All the features and the capabilities of both the installed supplies had been tested jointly by the representatives of the vendor and team of NHIEL, comprising of Dr. Nipan Das, Dr. S.S. Kausik, Mr. Agrajit Gahlaut (IPR), Mr. G.D. Sarma, Ms. Jinti Barman and Dr. B.K. Saikia.



(L) The HV DC Power supplies (R) the dummy load during test



Arrangement for wire burn and arc test

IPR Scientific Outreach



IPR participated in the "TARANG 2k19-Space Science Fest" held at the LD College of Engineering, Ahmedabad on 30th August, 2019. Ms Chhaya Chavda and Ms. Harsha Machchhar of Outreach Division delivered popular lectures on Plasma and its Applications at this event to graduate engineering students.



ITER Week - Vigyan Samagam @ Bengaluru

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The ITER week at "Vigyan Samagam" being exhibited at Bangalore was held during 20-24 August, 2019. During this week, Popular talks on plasma, its applications as well as on the ITER project were presented to students and public attending the exhibition. Also, IPR outreach division presented interactive exhibits of plasma and its applications, superconductivity and application of virtual reality in tokamak.

Dr. Ravi A V Kumar	Popular talk on "What is Plasma ? "
Ms. Chhaya Chavda	Popular talk on "Applications of Plasma"
Dr. P. N. Maya	Popular talk on "ITER Project - A quest towards fusion"
Prof. Shishir Deshpande	Popular talk on "ITER project- Overview and Challenges"
Dr. Mahenderjit Singh	Popular talk on "Ensuring India's deliverables to ITER - An Overview"



(L) Dr. Shishir Deshpande (remotely) and Dr. Mahenderjit Singh (R) Dr. P. N. Maya delivering their talks



(L) Ms. Chhaya Chavda (R) Dr. Ravi A V Kumar delivering their talks



Shri. K. N. Vyas, Secretary DAE and Chairman AEC, at the ITER stall



(L) Prof. Jayant Narlikar (R) Dr. Fabiola Gianotti, DG of CERN and Shri Arun Srivastava, Secretary-AEC, at the ITER stall



View of the audience for the popular talks during the ITER week



BSc Physics students from Christ College, Bangalore during their visit to the ITER week hands-on exhibition

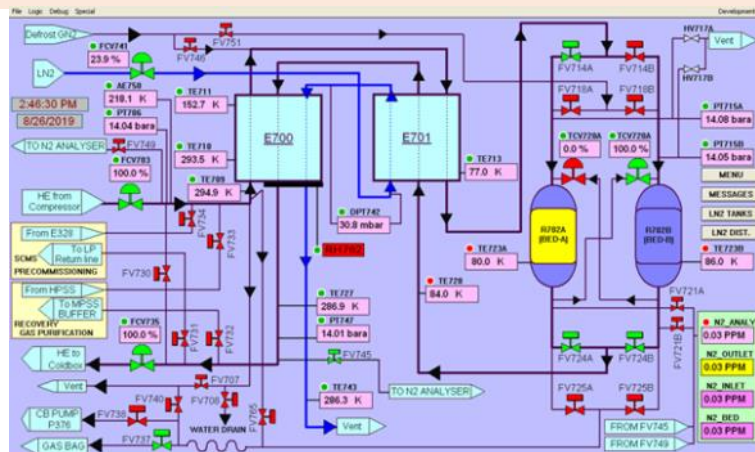


Public interacting at the hands-on exhibition of plasma & its applications during the ITER week

Retro-fitment of Eurotherm PC3000 PLC of Purifier for 1.3kW Helium Plant

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Helium Refrigeration cum Liquefier system of 1.3 kW at 4.5 K has four sub-systems namely compressor station, oil removal system, purifier and cold-box. The purifier is used to remove impurities (N_2 , O_2 , H_2O , Hydrocarbons (C_xH_y)) from Helium gas. Each sub-system is controlled by dedicated PLC and communicates to master cold-box PLC. Since the purifier system is equipped with an obsoleted PLC, it was imperative that the purifier system be retro-fitted with a state-of-the-art controls, *ie*, a new PLC, which was carried out with DACD. All sequential function chart (SFC) logics, process In/Out and communication interface are kept same. All modes of purifier such as on-line adsorption, pre-commissioning, E700 heat exchanger warm-up, bed warm-up, evacuation etc. have been checked with actual process. A new SCADA was developed in-house for operation of purifier system and easy troubleshooting during helium plant operation. The system is ready for upcoming SST-1 campaign.



(L) The control unit (R) Block diagram of the control unit

IPR@ Conferences



Dr. Mukesh Ranjan delivered a talk entitled "*Ellipsometry and its Applications*" and Mr. Vivek Pachichigar presented a poster entitled "*Superhydrophobic PTFE Surface Prepared by Low Energy Ar⁺ Ion Beam Irradiation*" at the 6-Day Workshop on Material Characterization: Structure, Spectroscopy and Microscopy" Organized by Department of Physics Institute of Infrastructure, Technology, Research and Management (IITRAM) Ahmedabad. Mr. Pachichigar was also awarded the best poster award for his poster at the workshop.

Exhibition of Scientific Books @ IPR

The IPR Library organized a one-day Exhibition of scientific books at IPR main campus for the benefit of IPR staff on 17 September 2019. The exhibition was envisioned to enhance the library collection by recommendations from the staff members by reviewing the contents of the books. The staff also had the opportunity to purchase books personally from the exhibition. A large number of staff and research scholars visited the exhibition and recommended books for procurement by the library.



प्लाज्मा भौतिकी केंद्र - प्लाज्मा अनुसंधान संस्थान में हिंदी दिवस के उपलक्ष में ११ सितम्बर, २०१९ को हिंदी समारोह का आयोजन किया गया। कार्यक्रम का उद्घाटन केंद्र निर्देशक महोदय प्रो. बी के सैकिया ने हिंदी राजभाषा के कुछ शब्दों के साथ किया, तत्पश्चात डॉ. एस आर मोहन्ती ने अपने वक्तव्य में प्लाज्मा भौतिकी के ऊपर गहरा प्रकाश डाला। हिंदी समारोह के शुभ अवसर पर विभिन्न प्रतियोगिताओं का भी आयोजन किया गया, जिसमें की निबंध लेखन, तात्कालिक भाषण और पूर्व प्रधान मंत्री स्वर्गीय अटल बिहारी वाजपेयी द्वारा रचित कविता - कदम मिला कर चलना होगा, का पाठन भी शामिल था। दर्शकों ने कार्यक्रम के समूह गीत (छोड़ो कल की बातें....) और भिन्न एकल गीत का आनंद भी उठाया। सभी प्रतियोगिताओं में तात्कालिक भाषण बहुत रोचक और प्रतियोगिता पूर्ण रहा। कार्यक्रम के अंत में समारोह के विजेताओं को पुरस्कृत किया गया। पुरस्कार पाने वाले विजेता के नाम हैं - डॉ. टी के बोरठाकुर, डोनी जिगदुंग, गुंजन शर्मा, सुमित सिंघा, सुरामोनी बोरठाकुर, और श्री सतिंद्र शर्मा। पूरे समारोह के संचालन का भार डोनी जिगदुंग ने उठाया। डॉ. बी जे सैकिया, डॉ. एस आर मोहन्ती, रिकू मिश्रा विभिन्न प्रतियोगिताओं के निर्णायक रहे। अंत में रिकू मिश्रा ने कार्यक्रम सफल बनाने हेतु सभी को धन्यवाद दिया।



सीपीपी-आईपीआर कर्मचारियों द्वारा गाया गया समूह गीत।



(L, M) पुरस्कार वितरण। (R) एकल गीत।



हिंदी समारोह के श्रोतागण

IPR participated in the 36th DAE Safety & Occupational Health Professionals Meet-2019 was jointly held by Atomic Energy Regulatory Board (AERB) and Nuclear Fuel Complex (NFC) from 21 to 23 August, 2019 at Hyderabad. The meet was attended by Shri Dinesh Kumar Gupta, Shri Devendra Modi, Dr. Mayur Kakati and Shri Rajiv Sharma. A poster was presented on “Implementation and Enhancement of Safety Measures in SST-1 Cryogenic System” by Shri Sharma. Shri Miteshkumar Patel won the consolation prize for his slogan “Operational experience helps to enhance industrial safety, without its effective management, get ready for penalty” in the English Safety Slogan Competition.



Distribution of Books at IPR Library

IPR library had arranged distribution of books by displaying the books which were not part of the library's collection (these were either duplicates/received for free or donated). The books were displayed in the library from 27 to 30 August 2019. A large number of Library members visited the library to browse through these titles and picked books of their choice. The distribution was carried out on a first-come-first-served basis.



Colloquium @ IPR

A colloquium talk entitled “Can one plan to do Great Research?” was presented by **Prof. Amit Roy**, on 20th September, 2019 at IPR. Prof. Roy was the former director of Inter-University Accelerator Centre (IUAC), New Delhi, and during his tenure at IUAC, he led the team for building the Superconducting Linac at IUAC and pioneered the development of Niobium superconducting cavity for accelerators in India.

Prof Roy, in his talk, discussed why everyone is not successful in doing high impact research and what were the various factors that come into play doing research and how one can overcome them to successfully do high impact research.

Professor Roy is a Fellow of the National Academy of Sciences, India. He received the Eminent Scientist award of the Indian Nuclear Society. He has served as President of Indian Cryogenics Council, Chairman of Asian Committee of Future Accelerators, as a member of International Committee for Future Accelerators and as a member of Nuclear Physics Working Group of IUPAP. After retirement, he was DAE Raja Ramanna Fellow at Variable Energy Cyclotron Centre, Kolkata, till May 2017. Currently, he is a Guest lecturer at Indian Association for the Cultivation of Science, Kolkata.



Educational Visits to IPR/FCIPT – September 2019

Name Of the Institution	Date	Number of visitors
Dr. Subhash Technical Campus -Junagadh,	18-Sep-2019	30 computer Engineering Diploma (2nd, 3rd year) students
Baroda Lions School, Wadi, Vadodara	20-Sep-2019	96 Students from SSC and HSC Classes ,
Shri Labhubhai Trivedi institute of Engineering & Technology (SLTIET) Rajkot	25-Sep-2019	50 Computer science and engg.(5th 7th sem) students
Indus University, Tahltej, Ahmedabad	25-Sep-2019	29 students of Metallurgical engineering, 3rd year



Students from Dr. Subhash Technical Campus, Junagadh during their visit to IPR



Students from SLTIET, Rajkot during their visit to IPR



Students from Baroda Lions School, Wadi, Vadodara during their visit to IPR

- ♦ **Mr. Alamgir Mondal**, Institute for Plasma Research, Gandhinagar, gave a talk on "*Investigation of Laser Induced Plasma in Various Configurations*" on 6th September 2019
- ♦ **Dr. Dipak Bhowmik**, VECC, Kolkatta, gave a talk on "*Surface and interface modification by low energy ion beams*" on 12th September 2019
- ♦ **Dr. Omkant Jha**, I. Sc., B. H. U., Varanasi, gave a talk on "*Structural and Vibrational Investigations of Some Neurotransmitter Molecules*" on 16th September 2019
- ♦ **Mr. Rupak Mukherjee**, Institute for Plasma Research, Gandhinagar, gave a talk on "*Turbulence, flows and magnetic field generation in plasmas using a magnetohydrodynamic model*" on 18th September 2019

Upcoming Events

- ♦ 3rd Asia-Pacific Conference on Plasma Physics (AAPPS-DPP2019), Hefei, China, 4-8 November 2019 <http://aappsdp.org/DPP2019/index.html>
- ♦ 28th International Toki Conference on Plasma and Fusion Research, Toki-City, Gifu, Japan, 5-8 November 2019 <http://itc.nifs.ac.jp/index.html>
- ♦ 12th International Conference on Plasma Science and Applications (ICPSA 2019), University of Lucknow, Uttar Pradesh, 11-14 November 2019 <https://icpsa2019.com/>
- ♦ 14th Asia-Pacific Physics Conference (APPC14-2019), Kuching, Malaysia, 17-22 November 2019 <http://appc2019.ifm.org.my/>
- ♦ IAEA Training Workshop on Joint Experiments on Fusion Devices, Prague, Czech Republic, 18-22 November 2019 <https://www.iaea.org/events/evt1701878>
- ♦ One Day Seminar on Plasma Technologies for Health Sector (PTHS-2019), 29-Nov-2019, IPR, Gandhinagar

Know Our Colleagues



Ms. Monica J. Fernandes (Sr. Office Asst) joined IPR as Office Clerk in April 1982 and since then has been working with the Purchase Section. As part of her job profile, she looks after purchase of goods from foreign vendors, which essentially is placement of purchase orders and its execution, also including pre-audit clearance, placement of purchase orders, providing end-user statements, obtaining order acknowledgments/

proforma invoices for arranging advance payments and opening of letter of credits, order follow up for execution/shipment which includes providing approval for test reports/drawings and issue of dispatch clearance letters for effecting the shipments by overseas suppliers.

She also looks after arranging insurance for import consignments, providing cash flow statement to PMG and preparation of purchase order details for RTI page. She manages to obtain bank guarantees towards security Deposit and Performance Bank Guarantee and its monitoring and release to vendors through Accounts on completion of contractual obligations by the vendors.

She interacts with Stores, Accounts and departments to maintain purchase records and provide purchase files to Auditors as and when required.

Mr. Gaurav G. Bhatt (Office Assistant-A) joined IPR as Office Clerk - A in 1997 with IPR Stores section. He looks after Pre material issue activities like P O reminder, payment preparation, LSC & L R cleaners, free issue material and Post Material receipt activities. He also manages Invoice, Freight documents, PBG, Transport material management, material gate-pass, stock items, Material disposal, Physical verification of



equipment, internal and external audit query etc. He was part of the team which established an online web based system integrated between Purchase, Accounts and Stores named "PAST". He was directly involved in installation of safe storage system (Optimizer) for Stock Items and Record keeping. He was successful in achieving reduction in shortage and Excess in stock quantity and value upto 0.001%. He received an appreciation Certificate from Director, IPR for successfully launching the Online Capital Register of IPR.

He is also a core member of the team to develop an online RGP-NRGP System. Mr. Bhatt has also been associated with Cricket Activities of the Institute since 1997. He also actively participates in events like National Science Day, IPR Summer School program, Conference organized / sponsored by IPR and IPR Staff Club Activities. During his service, he has successfully completed his LLB and Diploma in Materials Management.

The IPR Newsletter Team

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