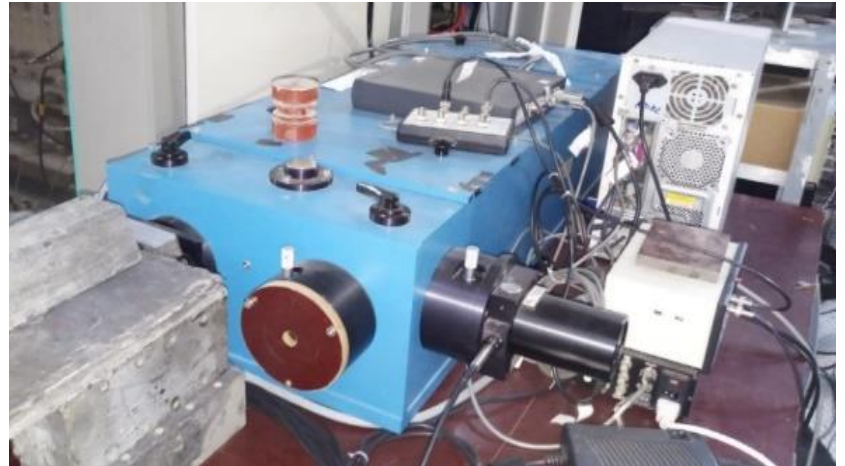
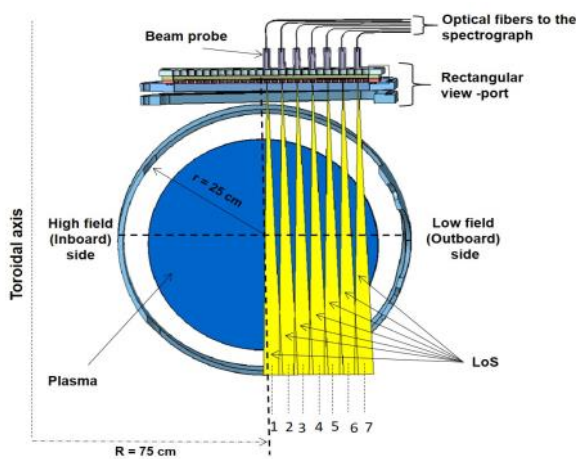


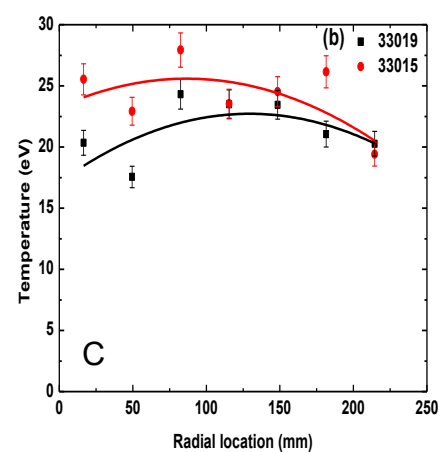
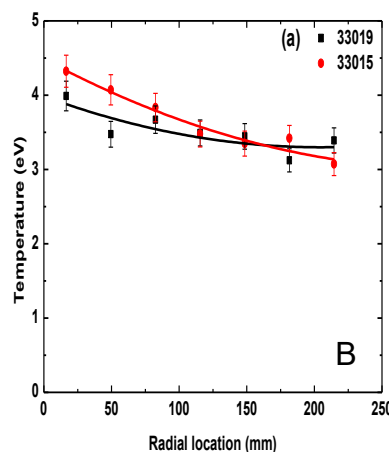
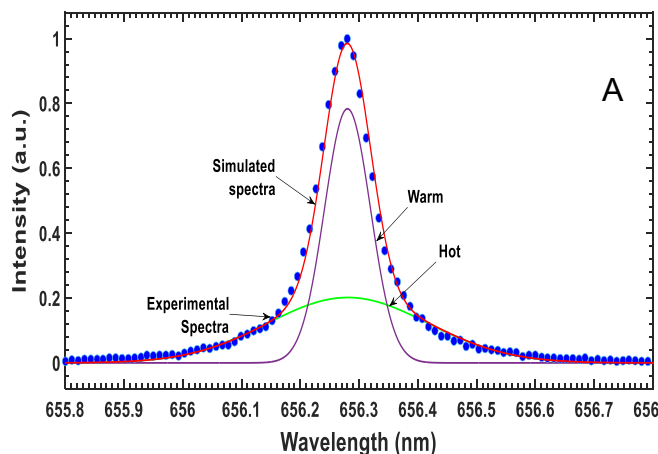
Neutral Temperature Measurement in Aditya-U Tokamak

A high-resolution visible spectroscopic system has been utilized to measure the spatial and temporal profiles of the ion temperature of neutral hydrogen (TH) using Doppler broadened $H\alpha$ (656.3 nm). The system consists of a 1 m long spectrometer coupled with a CCD detector. The entrance slit of spectrometer is coupled to a vertical array of nine fiber to get multi-track measurement. This array feed light into the spectrometer transported using another 13 m long fiber connected to lenses collecting light through an in-house developed rectangular viewport from different lines of sight (LoS) passing through the various plasma radial locations.



(L) Schematic of the different LoS in Aditya-U (R) Spectrometer used for this measurement

The spectral width due to the Doppler broadening is directly proportional to neutral or ion temperature enabling the temperature estimation. However, in the presence of the magnetic field, the energy levels of atoms are split into multiple levels due to Zeeman Effect generating many Zeeman split lines, therefore adding to the broadening of the $H\alpha$ spectral line. Accurate estimation of Doppler broadening for the temperature measurement is needed to be done after incorporating broadening due to the Zeeman Effect as these lines are not distinctly detectable by the spectrometer. A MATLAB code has been developed to estimate the neutral and ion temperatures after incorporating the Zeeman Effect.



For Aditya-U tokamak, the analysis has been carried out for several discharges by fitting the spectral line profile through the simulation of all Zeeman split line when tokamak is operated with 1.2 T of toroidal field and considering the TH has two components, warm and hot as illustrated in Fig. A. The spatial profiles of the neutral temperature for both warm and hot components of neutral in the Aditya-U plasma are shown in Fig. B and C for the shots no. 33015 and 33019 respectively.

India's first mega science exhibition, "Vigyan Samagam" concluded its second leg at the Visvesvaraya Industrial and Technological Museum, Bangalore (VITM) on 29th September, 2019 and has now moved to the Science City, Kolkata and will be on exhibit till 31-Dec, 2019. During the 2 month programme at Bengaluru, 35 scientists/engineers from ITER-India and IPR participated in this event for manning the ITER stall, delivering popular and technical talks at various programmes of the exhibition as well conducting the hands-on experiments and demonstrations during the ITER week held during 20-24 August, 2019. The Kolkata event was inaugurated on 4th October, by Dr. Harsh Vardan, Hon. Minister for Science & Technology, Govt. of India through video conferencing. The ceremonial lamp was lit by Dr. Shekar Basu (Ex-Secretary, DAE) and Prof. Ashutosh Sharma (Secretary, DST). During the inaugural programme, Dr. Shishir Deshpande and Ms. Aparajita Mukherjee delivered talks on ITER and India's contribution to ITER. The exhibition was also inaugurated and visited by the dignitaries. ITER week was also organized at the exhibition during 12-16 November, 2019.



Images from the inauguration of the Vigyan Samagam, Kolkata



Images from the ITER stall at the Vigyan Samagam, Kolkata

हिंदी पखवाड़ा समारोह 2019

4

प्लाज्मा अनुसंधान संस्थान में 3 सितंबर, 2019 से 17 सितंबर, 2019 तक हिंदी पखवाड़ा समारोह पूरे उत्साह के साथ मनाया गया। इस दौरान कुल 11 प्रतियोगिताएँ आयोजित की गई - नारा लेखन, निबंध लेखन, हिंदी टाइपिंग, टिप्पण एवं अनुवाद, तकनीकी/प्रशासनिक लेख लेखन, प्रश्नोत्तरी, चाय पर चर्चा, समाचार वाचन, वादविवाद, तात्कालिक भाषण एवं स्वरचित कविता-पाठ, जिसमें लगभग 160 प्रतिभागियों ने भाग लिया।

17 सितंबर को समापन समारोह में संस्थान के निदेशक एवं राभाकास के अध्यक्ष डॉ. शशांक चतुर्वेदी ने गृह मंत्री के प्रेरणास्पद संदेश का वाचन किया। श्री प्रवीण कुमार आत्रेय, डीन आर एंड डी एवं राभाकास के सदस्य ने पऊआ के अध्यक्ष एवं पऊवि के सचिव के संदेश का वाचन कर संस्थान में राजभाषा के सुचारू रूप से कार्यान्वयन हेतु स्टाफ सदस्यों को प्रेरित किया। निदेशक महोदय ने संस्थान में शुरू की गई अंतर-अनुभागीय चल राजभाषा शील्ड योजना के अंतर्गत राजभाषा में श्रेष्ठ कार्य हेतु संस्थान के प्रशासन अनुभाग - 1 को इस शील्ड से सम्मानित किया एवं राजभाषा में उत्कृष्ट कार्य करने के लिए श्री आदित्य पंचासरा, कार्यालय लिपिक - बी एवं श्री राजीव शर्मा, वैज्ञानिक अधिकारी - डी को वर्ष 2018-19 का राजभाषा पुरस्कार प्रदान किया। इसके पश्चात् निदेशक महोदय एवं श्री प्रवीण कुमार आत्रेय द्वारा हिन्दी पखवाड़ा समारोह के सभी विजेताओं को प्रमाण पत्र एवं पुरस्कार प्रदान किये। राजभाषा कार्यान्वयन समिति के उपाध्यक्ष श्री राज सिंह ने संस्थान में हिंदी की प्रगति और उपलब्धियों को संक्षेप में बताया और राजभाषा नीति के कार्यान्वयन की सराहना करते हुए इस दिशा में और अधिक प्रयास करने का सुझाव दिया। निदेशक महोदय ने संस्थान में राजभाषा विभाग द्वारा उपलब्ध कराए गये कंठस्थ सॉफ्टवेयर का इस्तेमाल करने और हिंदी में ईमेल पत्राचार बढ़ाने पर जोर दिया। डॉ. संध्या पी दवे, हिंदी अधिकारी ने हिन्दी पखवाड़ा समारोह को सफल बनाने हेतु सभी को धन्यवाद दिया।

हिंदी पखवाड़ा समारोह के आयोजन हेतु एक उपसमिति का गठन किया गया था, जिसमें ये सदस्य सम्मिलित थे - श्री निरंजन वैष्णव, श्री हरिशंकर खण्डूरी, डॉ. सूर्यकान्त गुप्ता, श्री प्रशांत कुमार, श्री आनंद मिश्रा एवं डॉ. संध्या पी दवे। सभी सदस्यों के सहयोग से हिंदी पखवाड़ा समारोह की गतिविधियाँ सुचारू रूप से संपन्न हुई। हिंदी पखवाड़ा समारोह की विभिन्न प्रतियोगिताओं के मूल्यांकन में संस्थान के इन सदस्यों ने अपना योगदान दिया - डॉ. सूर्य कुमार पाठक, डॉ. राजेश कुमार, श्री हरिशंकर खण्डूरी, डॉ. मनोज कुमार गुप्ता, डॉ. सूर्यकान्त गुप्ता, डॉ. विपुल तन्ना, डॉ. अल्फोंसा जोसफ, श्री राज सिंह, श्री भरत दोशी, श्रीमती छाया चावडा, श्री निरंजन वैष्णव, श्री डी. रमेश, श्री हर्षद चामुंडे, श्री अनुज हार्वे, श्री देवेन्द्र मोदी, श्री आनंद मिश्रा, श्री सरोज दास, श्री श्रवण कुमार एवं श्रीमती शिल्पा खंडकर एवं डॉ. संध्या पी. दवे।



हिंदी पखवाड़ा समारोह के कुछ तस्वीरें



(L) हिंदी पुस्तक प्रदर्शनी। (R) पुरस्कार वितरण की तस्वीरें।



(L) हिंदी पखवाड़ा समारोह में श्रोता। (R) पुरस्कार वितरण की तस्वीरें।



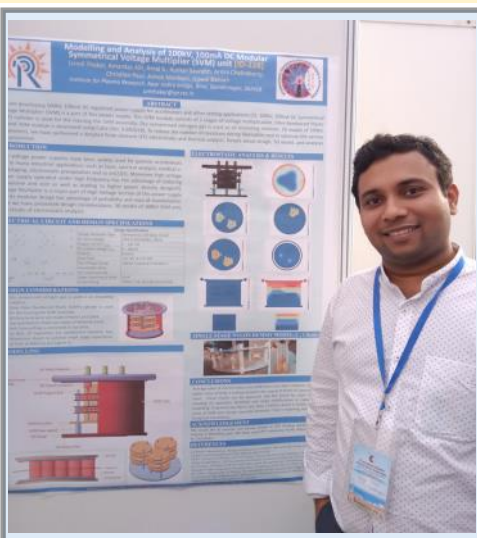
पुरस्कार वितरण की तस्वीरें।

IPR @ ICPSA-2019

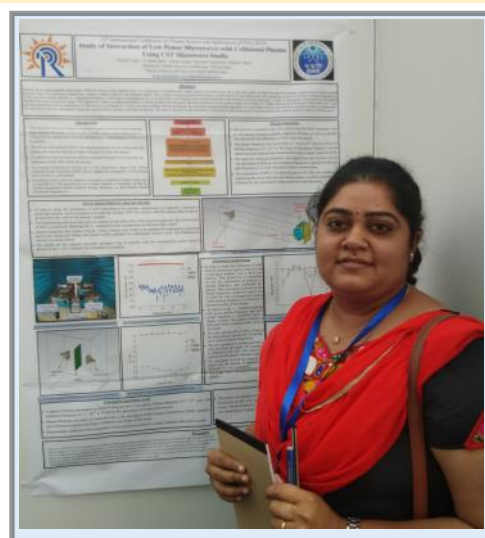
IPR participated in the 12th International Conference on Plasma Science and Applications (ICPSA 2019), organized by University of Lucknow, during 11-14 November 2019.



Mr. Akshay Vaid gave an oral presentation entitled "Plasma applications in cancer treatment"



Mr. Urmil Thakkar presented a poster entitled "Modelling and Analysis of 100kV, 100mA DC Modular Symmetrical Voltage Multiplier (SVM) unit"



Ms. Hiral Joshi presented a poster entitled "Study of Interaction of Low Power Microwaves with Collisional Plasma Using CST Microwave Studio"

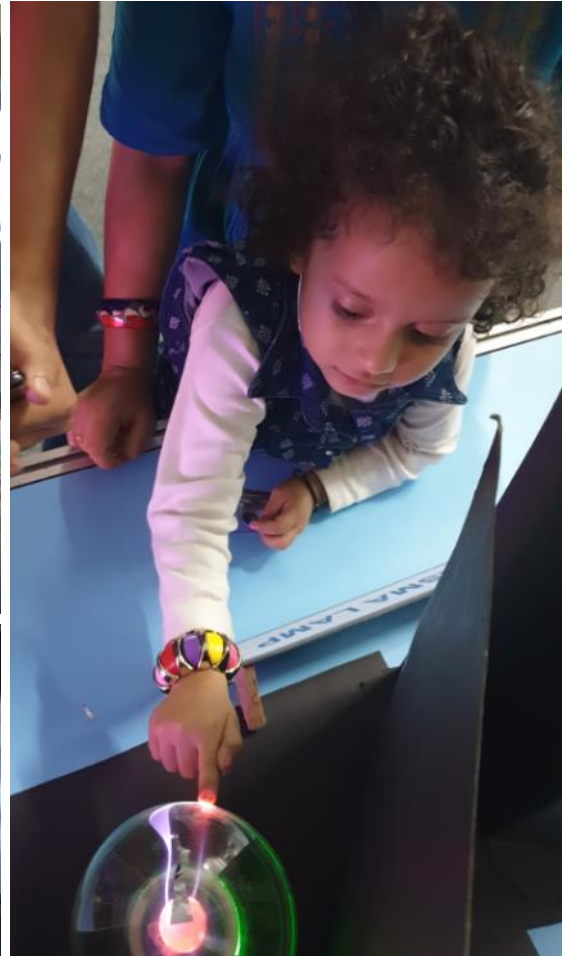
As part of the **Vigyan Samagam** exhibition, which is currently on at the Science City, Kolkata, The ITER week was organized during 12-16 November, 2019. As part of this programme, IPR and ITER-India organized popular talks, quiz programmes and hands-on demonstrations of plasma and its applications at the venue. Popular talks on Plasma and its applications were given by Dr. Ravi A.V. Kumar and Ms. Chhaya Chavda. Dr. Indranil Bandhyopadhyay and Shri Arun Chakraborty talked about the ITER project, its technical challenges and India's contribution to the project. IPR Outreach Division exhibited several live, hands-on demonstrations of plasma and its applications at the venue, which was visited by many schools from Kolkata.



(L-R) Dr. Indranil B, Shri Arun Chakraborty, Ms Chhaya Chavda and Dr. Ravi A V Kumar delivering their popular talks



Images from the ITER-week at the Vigyan Samagam, Kolkata



Images from the ITER-week at the Vigyan Samagam, Kolkata

Upcoming Events

- ◆ Universality: Turbulence Across Vast Scales, New York, 2-6 December 2019 <https://www.simonsfoundation.org/event/universality-turbulence-across-vast-scales/>
- ◆ 40th Fusion Power Associates (FPA) Annual Meeting and Symposium, Washington D.C, United States, 3-4 December 2019 <https://www.fusionpower.org/RegistrationForm.html>
- ◆ 34th National Symposium on Plasma Science & Technology, VIT Chennai, Chennai, 3-6 December 2019 <http://www.plasma2k19.org/index.html>
- ◆ 12th Asia Plasma and Fusion Association Conference, Shenzhen, China, 11-13 December 2019 <http://meeting.ipp.ac.cn/apfa2019/index.php>
- ◆ 11th Asia-Pacific International Symposium on the Basics and Applications of Plasma Technology (APSPT-11), Kanazawa, Japan, 11-14 December 2019 <http://apspt11.w3.kanazawa-u.ac.jp/>
- ◆ National conference on 'Cryogenics for Space' LPSC/ISRO, Thiruvananthapuram, 12-14 December 2019 <http://www.nccs2019.org.in/>
- ◆ National Conference on Recent Trends in Materials Science and Technology (NCMST-2019), IIST, Thiruvananthapuram, 18-20 December 2019 <https://events.iist.ac.in/ncmst2019/index.htm>
- ◆ 64th DAE Solid State Physics Symposium (DAE-SSPS 2019), IIT Jodhpur, 18-22 December 2019 <http://www.daessps.in/>

As a part of observance of Vigilance Awareness Week 2019 (28th October – 2nd November 2019), the Integrity Pledge was taken by IPR staff on 30th October 2019 at 11.00 AM, with Dr. Shashank Chaturvedi, Director, and Dr. Anita V.P. CVO leading the pledge. Shri Niranjan Kumar, Integrated Finance Adviser, Indian Defence Accounts Service (IDAS), HQ Southern Command, Pune, gave a talk on the theme “Integrity - a way of life” on 1st November 2019 at Seminar Hall, IPR.

Shri A. E. Harvey gave a talk on “Vigilance, Integrity and Conduct Rules” at IPR on 6th November 2019 followed by a Quiz Competition. A small video demonstration also was presented by the CVO, IPR.



The Integrity Pledge being taken by IPR staff with Dr. Shashank Chaturvedi, Director, and Dr. Anita V.P. CVO



(L-R) Dr. Anita V.P. CVO, Shri Niranjan Kumar, IFA-IDAS and Shri Anuj Harvey delivering their talks



Ms. Falguni Shah, Accounts Officer, IPR addressing the gathering

Educational Visits to IPR/FCIPT – Oct-Nov 2019

Name Of the Institution	Date	Number of visitors
School of Library and Information Science (SLIS), Central University of Gujarat (CUG), Gandhinagar,	22 nd Oct, 2019	13 students and 3 faculty members
Delhi Public School, Bopal, Ahmedabad	6 th Nov, 2019	49 students of 10th std, science stream and 2 faculty members



Students from SLIS, Gandhinagar, during their visit to IPR



Students from Delhi Public School, Bopal, Ahmedabad during their visit to IPR

Two groups of 50 graduate students each, from the Royal Global University, Guwahati, visited CPP-IPR on 18th and 19th November. They visited the laboratories and interacted with the scientists and researchers. An introductory lecture on plasma physics and its application was also presented to the visiting students.



Students of the Royal Global University, Guwahati, during their visit to CPP-IPR

IPR @ ICPSA-2019

IPR participated in the 12th International Conference on Plasma Science and Applications (ICPSA 2019), organized by University of Lucknow, during 11-14 November 2019.



Dr. Sudhir Nema delivered a keynote address on Industrial applications of plasma



Dr. Mukesh Ranjan gave a talk on "Plasma Produced Patterned for Sensing Applications",



Dr. Vishal Jain gave a talk on "Plasma applications in textiles"

Plasma Trophy - 2019, an annual cricket tournament organized by the IPR staff club began from 9th November 2019. A total of more than 160 players in 11 teams are playing for the cup this year. The matches are held on weekends and public holidays at the cricket field located near Zundal circle. A total of 25 matches will be played in the league round. The final match will be played on 22nd December 2019.



Volleyball Tournament - 2019 was organized by IPR staff club from Sept to Nov 2019. A total of 9 teams participated in the tournament. Total 24 matches were played in the first two rounds. The final match of the tournament held on 19th Nov 2019 between PDF Blockers and TTP United, PDF Blockers won the match by 2-0 to win the tournament.



The first element of quench cryoline SQL (Group-Y) has been lifted and successfully positioned inside the tokamak building at B2 level supplied by M/s. INOXCVA which marks an important milestone in cryoline project. The cryoline is assembled by the contribution from skilled Indian workforce duly qualified to work in accordance with French norms and standards. The function of the cryoline is to depressurize and recover the cold helium at 4 kelvin from superconducting magnets to quench tank in case of magnet quench event. The cryoline has to satisfy the stringent criteria as a SIC-2 cryoline (Safety Important Component).

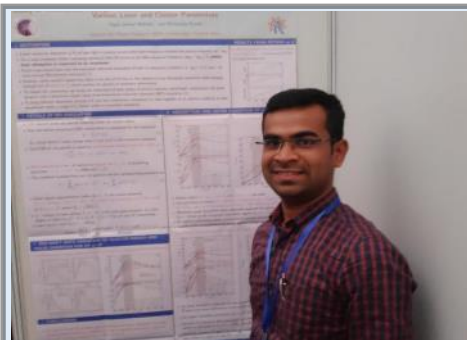


Cryo-line positioned in its final location supported through embedded plates of the building

IPR @ ICPSA-2019



Ms. Minsha Shah gave oral presentation on "*High voltage high speed trigger control circuit for SMARTEX-C device*" at the International conference on Electrical & Electronics System Engineering held at Guwahati from 2-3 Nov, 2019.



Mr. Sagar Sekhar Mahalik gave a poster presentation entitled "*Study of resonance absorption of short laser pulses in a deuterium cluster with various laser and cluster parameters*"



Ms. Nisha Panghal gave a poster presentation entitled "*Length Variation Of Argon Plasma Column With Varying Input Power In A Sealed Glass Tube*".

Dr. Pintu Bandyopadhyay, Associate Professor at IPR received the biennial “Buti Foundation Award” in the field of Plasma Science & Technology for the year 2019.. The award was presented to him during the foundation day function of PRL, at the Physical Research Laboratory, Ahmedabad on 11th Nov, 2019. Dr. Bandyopadhyay was conferred with this award for his outstanding contribution in the field of Experimental Basic Plasma Physics, particularly in the area of Complex (dusty) Plasmas. On behalf of IPR, we congratulate Dr. Bandyopadhyay for this achievement.



Dr. Pintu Bandyopadhyay receiving the Buti Foundation award from Prof. Bimla Buti in the presence of Shri A. S. Kiran Kumar (Ex Chairman, ISRO) and Dr. Anil Bhardwaj, Director, PRL.

Know Our Colleagues



Ms. Jyoti Agarwal joined IPR in November, 2008 (TTP2008) and was associated with the Cryopump and Injector Division from Nov, 2009 to Mar, 2018. Currently she is with the Fusion Reactor Design Division (FRDD). She worked on the indigenous development of helium cooled cryopumps for fusion machines, and also on development of various indigenous technologies required for cryopump such as sorbents, inorganic and organic adhesives for cryo applications, 4K cryopanel development etc. She also contributed to the development of indigenous axial valve system for large cryopump with indigenous sealing components. She also worked towards the “Make in India” concept and contributed towards Indigenous development of the technologies, which were being imported.. Her other areas of interest include, Vacuum, cryogenics and material science. She is currently working on development of theoretical model for dielectric barrier discharge (DBD) plasma devices.

Mr. Lavkesh T. Lachhvani joined IPR as Scientific Assistant- B in 2002 with Infrared Thermography Division after completion of his B Sc Physics from Saurashtra University in 2002. During service, he obtained his M.Sc. Degree from University of Pune and Master in Nuclear Fusion and Plasma Physics (University of Ghent, Belgium through Erasmus Mundus fellowship). Currently, he is pursuing his PhD at HBNI. His main activities included Thermography of Aditya Plasma Facing Components and Non-Destructive testing of materials using IR thermography. From 2007, he moved to the Electron-Positron Plasma Experimental Group, where he worked on trapping of high q/m_e charged particles in atmosphere, 50Hz operated Paul trap, and development of Paul trap for electron plasma experiments. Currently he is a Scientific Officer-D and working with the Fundamental Plasma Experimental Division / Non-Neutral Plasma Section. His area of work is Non-Neutral Plasma, Investigation of turbulence and flows in high-Te tokamak plasma. During his work he has achieved record of the longest confinement time of toroidal electron plasmas in SMARTEX-C, which is the smallest aspect ratio Toroidal Non Neutral plasma Experiment.



- ◆ **Dr. Subir Biswas**, Institute of Advanced Study in Science and Technology, Guwahati, Assam, gave a talk on "*Spectroscopic measurements of electric and magnetic field distributions in a relativistic self-magnetic-pinch diode*" on 24th October 2019
- ◆ **Dr. Promit Moitra**, Indian Institute of Science Education and Research (IISER), Mohali, gave a talk on "*Dynamics on spatially extended systems*" on 25th October 2019
- ◆ **Mr. Yogesh M. Jain**, Institute for Plasma Research, Gandhinagar, gave a talk on "*Studies on the Design and Development of a Passive Active Multi-junction based LH launcher compatible with ADITYA–Upgrade tokamak*" on 29th October 2019
- ◆ **Dr. Parnika Das**, Variable Energy Cyclotron centre, Kolkata, gave a talk on "*Precision mass measurement using Penning Ion trap at VECC*" on 30th October 2019
- ◆ **Mr. Jervis Ritesh Mendonca**, Institute for Plasma Research, Gandhinagar, gave a talk on "*Flow Effects on Viscous-resistive modes in a Tokamak*" on 11th November 2019
- ◆ **Prof. Vinod Krishan**, Indian Institute of Astrophysics, Bangalore, gave a talk on "*Three Fluid Effects in Magnetic field Generation*" on 13th November 2019
- ◆ **Ms. Bhumika Thakur**, Institute for Plasma Research, Gandhinagar, gave a talk on "*Study and Determination of Dynamical Systems*" on 14th November 2019
- ◆ **Dr. Gayatri Dhamale**, BARC, Mumbai and Pune University, Pune, gave a talk on "**Thermal plasma synthesis of nanoparticles: simulation and experimental based study**" on 15th November 2019
- ◆ **Dr. Umesh Kumar Gaur**, FCIPT, IPR Gandhinagar, gave a talk on "*Growth of Co and Co/Ag ordered nanostructures on ion beam irradiated patterned Si substrate for magnetic anisotropy studies*" on 23rd November 2019

Obituary



Shri Jayant Chandulal Patel
(13 Nov 1961— 17 Nov 2019)

Mr. Jayant C. Patel, Scientific Officer-F, passed away on 17 November 2019 at Jaisalmer due to a massive heart attack.

Mr. J.C. Patel joined IPR in 1989 and he has served as senior mechanical and cryogenics engineer at IPR for last 30 years. During his first 10 years at IPR, he had developed the IPR workshop facility which included setting up various equipment such as lathe machines, milling machines, drill machines etc., which were essential for the workshop. During 1995-1996, he joined the SST-1 Cryogenics division, where he contributed significantly. His main area of expertise was in the field of installation, commissioning, operation and maintenance of helium compressors, air compressors and recovery compressors and their piping.

He proved to be an expert mechanical engineer in setting up high and medium pressure helium gas storage tanks and liquid nitrogen tanks. He was also managing the inventory of helium gas and liquid nitrogen at IPR. He was always available for technical consultancy in cryogenics, compressors and warm gas management within and outside of IPR. During his service, he obtained his master degree in Cryogenic Engineering and MBA in Finance. His scientific and technical contribution will be always be remembered. We have lost a very joyful, enthusiastic and dynamic colleague.

We pray that his soul rests in eternal peace !

The IPR Newsletter Team

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