

Issue 07  
July 2016

# The 4<sup>th</sup> State

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

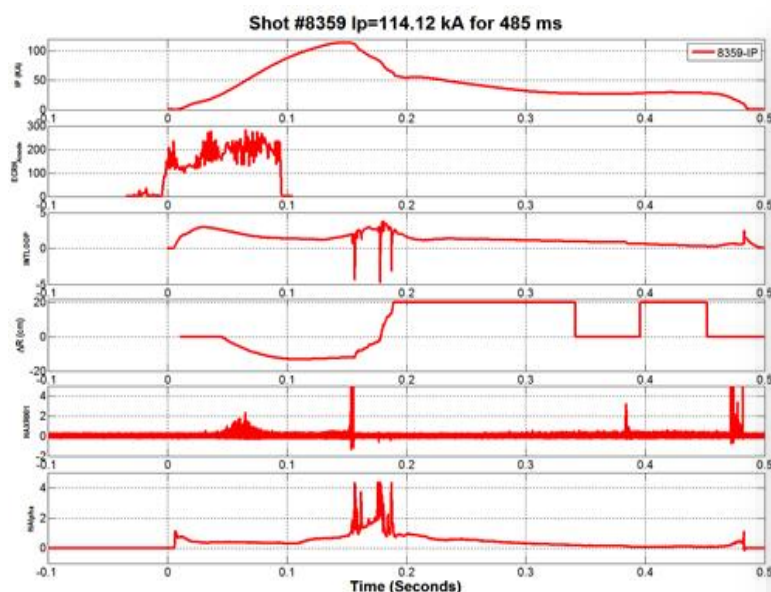
## SST-1 News

The 18<sup>th</sup> Experimental campaign in SST-1 began on 29<sup>th</sup> April and has been continuing since then. The experimental phase in SST-1 began from 14<sup>th</sup> May 26, 2016. Attaining higher currents, lengthening of the current flat top and bringing in final plasma equilibrium indices with in-vessel Radial Control Coils were some of the physics objectives in this campaign.

Extending the experimental cryogenic window beyond fifteen days with a modified cryogenic cooling was the technological objective of this campaign. SST-1 has, in this campaign, attained a maximum plasma current of 112500 A at a central field of 1.5 Tesla, exceeding the design value of 110000 A under identical conditions.

The plasma duration in SST-1 has now been stretched up to 450 ms. Since last two campaigns the divertor configuration influencing Poloidal Field magnets, PF-3 have been superconducting in SST-1 after implementing a modified hydraulic scheme. In this campaign, the cryogenic window was also successfully extended up to three weeks.

During the campaign, the SST-1 Project Monitoring Board also reviewed the SST-1 progresses and issues on 23<sup>rd</sup> May 2016.



(L) Typical Plasma shot with 114.12 KA plasma current from campaign 18. (R) SST-1 Project Monitoring Board meeting in progress

## MoU Between IPR & IEK-4



The Institute of Energy and Climate Research - Plasma Physics (IEK-4), Forschungszentrum Jülich GmbH (FZJ), Germany and the Institute for Plasma Research (IPR), recognizing the mutual benefits obtainable in the field of Nuclear Fusion from the research cooperation on fusion science and technology between the two Institutes, have signed a Memorandum of Understanding (MoU) for academic and research cooperation.

This MoU, which comes under the umbrella agreement between Government of India and the European Atomic Energy Community in the field of fusion energy research, was signed on 28th April, 2016 by the Directors of IPR and IEK-4.



Under this five year MoU (renewable), cooperative and joint research activities will be initiated on areas of fusion science and technology, such as fusion material development, plasma material interaction studies, tungsten - plasma spectroscopy and related technology, and on the plasma and fusion experimental programs of both Institutes. There would also be exchange of researchers and PhD students between the two institutes with the intent of learning, training, lecturing, conducting seminars and engaging in workshops and research.



As per the directives received from Ministry of AYUSH, Govt. of India, IPR celebrated the International Yoga Day on 21<sup>st</sup> June in the lawns of the main campus. The theme of the programme was "**Yoga for Harmony and Peace**". A Yoga demonstration session of around forty five minutes was organized in which students, faculty and administrative staff took part enthusiastically. Under the guidance of three invited experts, various Yoga postures and asanas were performed. Yoga session started with a little prayer followed by *Sookshma Vyayam*, *Vajrasana*, *Tadasana*, *Vrikshashana*, *Surya Namaskar*, *Nadi Shodhan Pranayama* and *Bhramaree Pranayama*. IPR Staff members participated in these session were very satisfied as the Yoga session was quite a relaxing and refreshing experience for them. After a light refreshment, an interactive talk on "*Benefits of Yoga for stress management and good health*" was arranged in the packed seminar hall in which the Yoga experts explained as to how the Yoga helps in releasing the stress and can be useful for the better living.







Kiran Patel

**Mr. Kiran Patel** from Diagnostics Division and **Mr. Arvind Singh** from Computer Division of IPR recently joined the IPR-CEA collaboration programme. Mr. Arvind will work in the area of IRFM-WMS (Wall Monitoring System) under Jean Marcel Traversé on “*Participation on PLATO integration into pre-pulse validation process, commissioning and usage during plasma operation*” while Mr. Kiran will work in the area of the Service Tokamak Exploitation & Pilotage (IRFM-STEP) under Philippe Jacques Moreau on “*Visible Spectroscopy Diagnostic and Driver development for IR Diagnostic*”.



Arvind Singh

A talk on the “Operation and Control System for Large Volume Plasma Device (LVPD)” was delivered by Ritesh Sugandhi, deputed to Institut de recherche sur la fusion magnétique (IRFM, France), during Reunion scientifique and technique on 06 June 2016. The talk discussed the development of the high end data acquisition and process automation system for LVPD.

A picnic was organized for the Indian collaborators on 3rd June 2016 at the “Tables du Labeou”, near the CEA campus at Cadarache. Indian and French delicacies were enjoyed by the participants in the scenic beauty of Luberon mountains at Saint Paul lez durance. The dance performances by Indian colleagues and cultural discussion after the lunch were much appreciated.



Ritesh Sugandhi delivering the talk at CEA



Indian and French collaborators of CEA during the picnic at the “Tables du Labeou”

## Congratulations !

**Shri. Sunil Misal** of Administration Division of IPR was awarded the DAE “हिंदी सेवी सम्मान पुरस्कार” for the year 2014-15 on 31st May 2016 for his commendable contributions in propagation and use of Hindi language in office.

The award consisted of a citation and a medal, which was presented to him by the Chief Guest Shri. Anil Kumar, Director general (Security), Dept. of Atomic Energy, Mumbai, at the 17th All India Official Language Conference held at Anushakti Bhavan, DAE Secretariat, Mumbai.

**IPR Newsletter congratulates him on this achievement !!.**



श्री सुनिल मिसाल हिन्दी सेवी सम्मान ग्रहण करते हुए



The main gate and security cabins of IPR were rebuilt after widening of the road and the related works have been completed. The Second gate which demarcates the secure zone of IPR also was modified with motorized gates and automated boom barriers.



(L) The second security gate and (R) The main gate and security cabins of IPR after they were rebuilt.



The boom barriers and the security cabin at the main gate.

## SSP-2016 Update

This year's Summer School Program (SSP-2016) began on the 30<sup>th</sup> May. 37 students from physics and engineering backgrounds from all over India have joined the program. The week long course work for the students has been completed and now they will carry out project work for five weeks. As a part of this program, the students also visited various labs of IPR and FCIPT. The students along with the SSP coordinators also had a one-day Picnic to Zainabad, the little Rann of Kutch. The students were taken for a safari in the expanses of the little Rann to see the Indian wild ass, the salt pans as well as for birdwatching the nesting flamingoes. The IPR SSP 2016 Committee members are ; Pintu Bandyopadhyay, Jinto Thomas, Varsha Siju, Mitul Abhangi, Hardik Mistry, Hiral Joshi, Jagabandhu Kumar and Bhargav Choksi.



The SSP-2016 students with the SSP coordinators at the Little Rann of Kutch



The BRNS-PFRC sponsored collaborative project entitled "Non-thermal plasma jet for blood coagulation and skin disease treatment" being carried out by the Department of Physics, Indian Institute of Engineering Science and Technology (IIST), Shibpur, Howrah, in collaboration with FCIPT has been underway since late 2015.

After obtaining the mandatory permissions from the Ethical Committee of the Dermatology department at PG Hospital Kolkata, the plasma jet developed under this project has been put on human trials for the first time. The trials are being conducted on patients suffering from *Tinea Curcis* (a type of fungal infection) in the presence of doctors of the PG hospital. The plasma jet developed works at 3.5 KV at a frequency of 50 KHz. The plasma so formed is the mixture of 99 % argon and 1 % oxygen. The affected patch of size 4 cm x 4 cm was treated for 20 min once a week for one month. After two treatments the affected area is showing progress. The PI in this project is Dr. Abhijit Majumdar from IIST and PC is Dr. Subroto Mukherjee from FCIPT.



Plasma jet being used for treatment of *Tinea Curcis*



Further, in order that this technology is utilized for the benefit of people, IPR, through it's FCIPT wing, transferred the proprietary Atmospheric Pressure Plasma Jet Technology for biomedical applications to Ahmedabad based M/s Aditya High Vacuum Pvt. Ltd.

The Atmospheric pressure plasma jet technology will enable to open new avenues of plasma technology applications in bio-medical and medical sector. The non-exclusive technology transfer agreement was signed on 23rd June, 2016 at the Director's Office at IPR.

The signed documents being exchanged between Shri A. Varadarajulu (Left) from IPR and Dr. N. Venkatramani (Right) from M/s Aditya High Vacuum Pvt. Ltd., Ahmedabad.

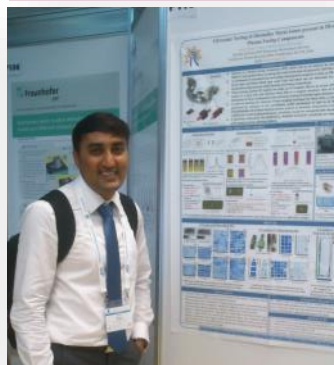
## Aditya Upgrade News

After Reassembly of Aditya Upgrade Tokamak and renovation of Aditya hall, Aditya Vacuum Division has started assembly of modified pumping lines to Aditya Upgrade vacuum vessel. Assembly of pumping line 1 at port no, 4 is completed up to PL1 Gate valve, which is seen in the image below. Before the assembly, all the components of the pumping lines are ultrasonically cleaned. Helium leak testing will be carried out at various stages during the pumping line assembly.



Installation of one of the gate valves on the pumping line # 1 in progress.





Mr. Kedar Bhope

Mr. Kedar Bhope of the Divertor & First wall Tech. Development Division presented a Poster on paper entitled **"Ultrasonic Testing of Dissimilar metal joints present in Divertor Plasma Facing Components"** in 19<sup>th</sup> World Conference on Non Destructive Testing (WCNDT-2016) during 13 to 17 June 2016 held at Munich, Germany Hosted by German Society of Non Destructive Testing (DGZfP).

IPR participated in the **"9th DAE-VIE 2016 Symposium on Emerging Trends in I and C & Computer Systems"** held at IGCAR, Kalpakkam on 24-25 June, 2016. Mr. Govind Lokhande, Mr. Prashant Singh, Mr. Aditya K. Swamy and Dr. Ravi A V Kumar represented IPR at this meeting which discussed emerging trends in IT, instrumentation & controls in various DAE units.



Dr. Mukesh Ranjan

Dr. Mukesh Ranjan won the best oral presentation in Young Scientist Meet conducted in the International Conference on Nanotechnology for Better Living at NIT, Srinagar jointly organised by IIT-Kanpur and NIT-Srinagar from 25-29/05/16. The title of his presentation was **"Sub-monolayer growth of Ag on flat and nanorippled SiO<sub>2</sub> surfaces"**

## WEST - Tungsten (W) Environment in Steady State Tokamak : Board Meet



The 3rd WEST Governing Board met at Cadarache on 12th May 2016 and deliberated on the steady project progress towards first plasma and approved the 2016-2018 experimental timeline. The meeting was chaired by Maria Faury, the CEA Sciences Division head for international relations, and was attended by ITER Organization, the French Research Federation on Magnetic Fusion, F4E, EUROfusion and various EU fusion institutes (IPP.CR, IPP, IPPLM, IFA, DIFFER), QST (Japan), SWIP (China), ASIPP (China), IPR (India), UNIST (Korea), US Department of Energy and ORNL (USA). IPR was represented by Prof. Abhijit Sen. (Source : [http://west.cea.fr/Images/astlmg/47/Newsletter\\_WEST13-VF\\_LD.pdf](http://west.cea.fr/Images/astlmg/47/Newsletter_WEST13-VF_LD.pdf))

## IPR Divisions & Groups - The Drafting Section



(L to R) Swadesh Kumar Patnaik, Vijay N Patel, Vishnu R. Prajapati, Kanubhai R. Rathod, Kirit R. Vasava and Pinakin K. Leuva

It may be rightly said that it is the Drafting Section of the Institute makes every structural idea of any group of the institute come alive by its first professional visualization. The drawings this section generates include conceptual, engineering and for final fabrication. This section is well equipped with modern hardware and latest software to make the drawings in various platforms that include AutoCAD, MDT and CATIA in both 2D and 3D formats. The engineering drawings generated for users are used for fabrication at the IPR workshop as well as outside. Work related to the Aditya upgrade, SST-1, High Power ICRH Cavity Assemblies, SMARTX experiment, TBM helicon assembly, Negative ion Extraction chamber with support structure for Centre for Plasma Physics Assam are some of their notable recent ones.



वर्ष 2014-15 के लिए परमाणु ऊर्जा विभाग का 17वाँ अखिल भारतीय राजभाषा सम्मेलन 31, मई 2016 को मुंबई में आयोजित किया गया। इस सम्मेलन में परमाणु ऊर्जा विभाग द्वारा अपनी विभिन्न इकाईयों, उपक्रमों और सहायता प्राप्त संस्थानों में राजभाषा हिंदी में सर्वोत्कृष्ट/रचनात्मक कार्य करने हेतु प्लाज़्मा अनुसंधान संस्थान को **राजभाषा शील्ड** से सम्मानित किया गया साथ ही सहायता प्राप्त संस्थानों के अंतर्गत संस्थान की गृह पत्रिका 'प्लाज़्मा ज्योति' को लगातार चौथे वर्ष के लिए **श्रेष्ठ राजभाषा गृह पत्रिका पुरस्कार** से भी सुशोभित किया गया। संस्थान के श्री सुनिल मिसाल, कार्यालय सहायक-ए को कार्यालयीन कार्य में हिंदी के प्रयोग के लिए एवं हिंदी गतिविधियों में उत्साहपूर्वक भाग लेने व नियमित रूप से संस्थान की हिंदी पत्रिका के लिए रोचक लेख लिखने हेतु **हिंदी सेवी सम्मान** (2014-15) से सम्मानित किया गया। यह गर्व का विषय है कि पिछले वर्ष भी संस्थान को पऊवि की इन तीनों पुरस्कारों की श्रेणी के अंतर्गत सम्मानित किया गया था। इस सम्मेलन में संस्थान के कार्यकारी मुख्य प्रशासनिक अधिकारी श्री प्रवीण कुमार आत्रेय एवं कार्यालय सहायक श्री सुनिल मिसाल ने भाग लिया।



श्री प्रवीण कुमार आत्रेय राजभाषा शील्ड ग्रहण करते हुए

## हिन्दी सेमिनार

राजभाषा कार्यान्वयन समिति, आईपीआर द्वारा संस्थान में हिन्दी सेमिनार के आयोजन की श्रृंखला उत्साहपूर्वक इस वर्ष भी जारी रही। इस वर्ष 6 मई, 2016 को हिन्दी सेमिनार में वैज्ञानिक/तकनीकी एवं सामान्य प्रशासनिक विषयों पर स्टाफ सदस्यों द्वारा विविध छः विषयों पर पावर पॉइंट प्रस्तुति दी गई। प्रस्तुतिकरण के दौरान प्रश्नोत्तरी प्रतियोगिता रखी गई जिसमें श्रोताओं ने उत्साह से भाग लिया। सेमिनार में निम्न विषयों पर प्रस्तुतिकरण दिया गया:

क्रम.सं.	प्रतिभागियों के नाम	विषय
1	राजीव शर्मा, इंजीनियर एससी	SST-1 के PF (पोलायडल फ़िल्ड) अतिचालक चुम्बकों के अपग्रेडेड हाइड्रोलेक्स के लिये 4.2 K इलेक्ट्रिकल इन्सुलेशन ब्रेक का स्वदेशी डिजाइन, विकास, निर्माण, और परीक्षण
2	अनुज हार्वे, प्रशासनिक अधिकारी-1	सूचना का अधिकार अधिनियम 2005-अवलोकन एवं मुख्य विशेषताएँ
3	ज्योति अग्रवाल, वैज्ञानिक एसडी	पदार्थों के उष्मीय गुण तथा उनके मापन की विधियाँ
4	रेखा सिंह, कार्यालय लिपिक ए	संस्थान के अनुभागों में राजभाषा हिन्दी का कार्यान्वयन
5	नितिन बैरागी, वैज्ञानिक एसडी	SST-1 हीलियम क्रायोजेनिक संयंत्र के संचालन में अशुद्धियों से जुड़े अनुभव
6	सुनिल मिसाल, कार्यालय सहायक ए	आईपीआर की अंशदायी स्वास्थ्य सेवा योजना

प्रपत्रों का मूल्यांकन श्री गौतमचंद सेठिया, श्री आर.यू.पंड्या एवं श्री वाई एस एस श्रीनिवास द्वारा किया गया। तकनीकी/वैज्ञानिक प्रस्तुतिकरण के अंतर्गत सुश्री ज्योति अग्रवाल को प्रथम, श्री नितिन बैरागी को द्वितीय एवं श्री राजीव शर्मा को तृतीय पुरस्कार तथा प्रशासनिक प्रस्तुतिकरण के अंतर्गत श्री अनुज हार्वे को प्रथम, श्री सुनिल मिसाल को द्वितीय एवं सुश्री रेखा सिंह को तृतीय पुरस्कार से सम्मानित किया गया। समापन समारोह में पिछले सत्र में हिन्दी परीक्षा (प्रवीण एवं प्राज्ञ) उत्तीर्ण करने वाले सदस्यों को प्रमाणपत्र वितरित किये गये।



हिन्दी सेमिनार की झलकियाँ

- ♦ **Dr. J. K. Atul**, Magadh University, Bodh Gaya, India, gave a talk on “Secondary Instabilities in the Dynamics of Farley Buneman Fluctuations” on 14th June 2016
- ♦ **Mr. Rajesh G. Trivedi**, ICRF Group and **Mr. Amit M. Patel**, Power Supply Group, gave a talk on “Integrated operation of 1.5 MW RF Source & 3 MW Dual Output High Voltage Power Supply for ITER: Preliminary experimental results” on 21st June 2016
- ♦ **Prof. Edward Thomas Jr.**, Physics Department, Auburn University, Auburn, Alabama, USA, gave a talk on “The Magnetized Dusty Plasma Experiment (MDPX) as a platform for basic and applied plasma physics research” on 22nd June 2016 (Colloquium # 260)

### Upcoming Events

- ♦ 11th International Conference on Open Magnetic Systems for Plasma Confinement, Budker Institute of Nuclear Physics Russia, 8-12 August 2016 <http://os2016.inp.nsk.su/>
- ♦ 22nd Topical Meeting on the Technology of Fusion Energy (TOFE), Philadelphia, 21-25 August 2016 <http://tofe2016.ans.org/>
- ♦ 2nd International Conference on Plasma Physics and Applications (PPA 2016), Xi'an, China, 24-26 August 2016 <http://www.engii.org/ws2016/Home.aspx?ID=782>
- ♦ International Fuzzy Logic and Intelligent Technologies in Nuclear Science Conference (FLINS), Roubaix, France, 24-26 August 2016 <http://flins2016.ensait.fr/>
- ♦ 8th Summer School and International Symposium on the Physics of Ionized Gases (SPIG 2016), Belgrade, Serbia, 29 August-2 September 2016 <http://www.spig2016.ipb.ac.rs/>

### Know Our Colleagues



**Mr. Mahesh Kumar Kushwah** Joined IPR in 1995 as a technical trainee and later in 1996 as an Electrical Engineer in the RF group. His main contribution was in the development of various high voltage power supplies and systems as required for ICRH, LHCD and ECRH operations and in conducting wire burn test for the protection of high power microwave tubes like Klystrons and Gyrotrons. The technology of serialising ignitrons to make the crowbar protection system is another achievement. He contributed in the initial commissioning and operations of Gyrotrons and Klystrons for auxiliary heating systems of Tokamaks. In 2008 he had been deputed at ITER-India in ECRH group. He visited to ITER organization to complete the task order of RAMI analysis for ITER ECH & ICH systems. Presently he is with the ITER Organisation, France, as an Electrical Engineer in Neutral Beam (NB) section and responsible for DNB power supply.

**Dr. Gourab Bansal** joined IPR as a technical trainee in 1995 and later as a Scientist in 1996 in the SST-1 magnetic group. Initially he worked on different aspects of superconducting magnets and contributed by developing and testing very low resistance superconducting joints made of NbTi Cable-in-Conduit Conductors. He developed flow meters for supercritical helium flow measurements and worked on diagnostics such as magnet displacements during cooldown, quench detectors, temperature and magnetic field measurements etc. He did his Ph.D in 2008 on development of Large Current Capacity High Temperature Superconductors at the National Institute for Fusion Science, Toki, Japan. Later in IPR he was engaged in the development of negative ion source test bed where he contributed developing different auxiliary systems and diagnostics and also in the installation and commissioning of negative ion source together with beam accelerator system. He successfully led the negative ion source experiments and extracted a 32kV negative ion hydrogen beam. He designed and developed a first of its kind long delivery line Caesium system for Diagnostic Neutral Beam for ITER. Presently he is at ITER organization, France. He is also a faculty of Homi Bhabha National Institute, India.



### The IPR Newsletter Team

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