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The Fourth State

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

27th IAEA Fusion Energy Conference (FEC-2018)

IPR hosted the 27th IAEA Fusion Energy Conference (FEC-2018) at Mahatma Mandir during 22-27 October, 2018. The meeting was inaugurated by lighting the traditional lamp by Dr. Meera Venkatesh Director of Division of Physical and Chemical Sciences in the Department of Nuclear Applications, at IAEA, Dr. R Chidambaram, former Chairman, AEC and Secretary, DAE, Dr. R. B. Grover, Member AEC, Dr. Shashank Chaturvedi, Director, IPR, Dr. S Deshpande, Project Director, ITER-India, Dr. P. A. Child, EURATOM, Prof. N. K. Prinja, AMEC Clean Energy, UK, representatives from IAEA Ms. Sehila M. Gonzales de Vicente, Dr. Danas Ridikas and the conference convener, Dr. Raju Daniel.

A total of 718 participants from 39 member countries of IAEA and 4 international organizations participated in this conference which has both oral (131) and poster presentations (641). Indian participants were 225 in number. An exhibition for vendors and institutes to showcase their wares and achievements. There were stalls in the exhibition from IPR, FCIPT, CPP-IPR as well as BARC along with exhibits from private agencies.

During the opening session, Dr. Venkatesh welcomed the gathering and mentioned the importance of the role of IAEA in fusion related activities. Dr. Chidambaram talked about the current energy crisis as well as India's contribution to fusion research. Dr. Grover emphasized upon India's power requirements and the need for a balance between currently available energy sources and appropriate options for the future. Dr. Deshpande gave a brief history of IPR and its fusion related activities as well as India's contribution to the ITER project. Dr. Child put forth the plans of EURATOM in fusion related activities for the next five years and finally, Dr. Prinja described the 4th industrial revolution of digitalization of industry and how it can be applied to fusion activities around the world. The Nuclear Fusion awards by IAEA were also presented to the winners during the inaugural session.

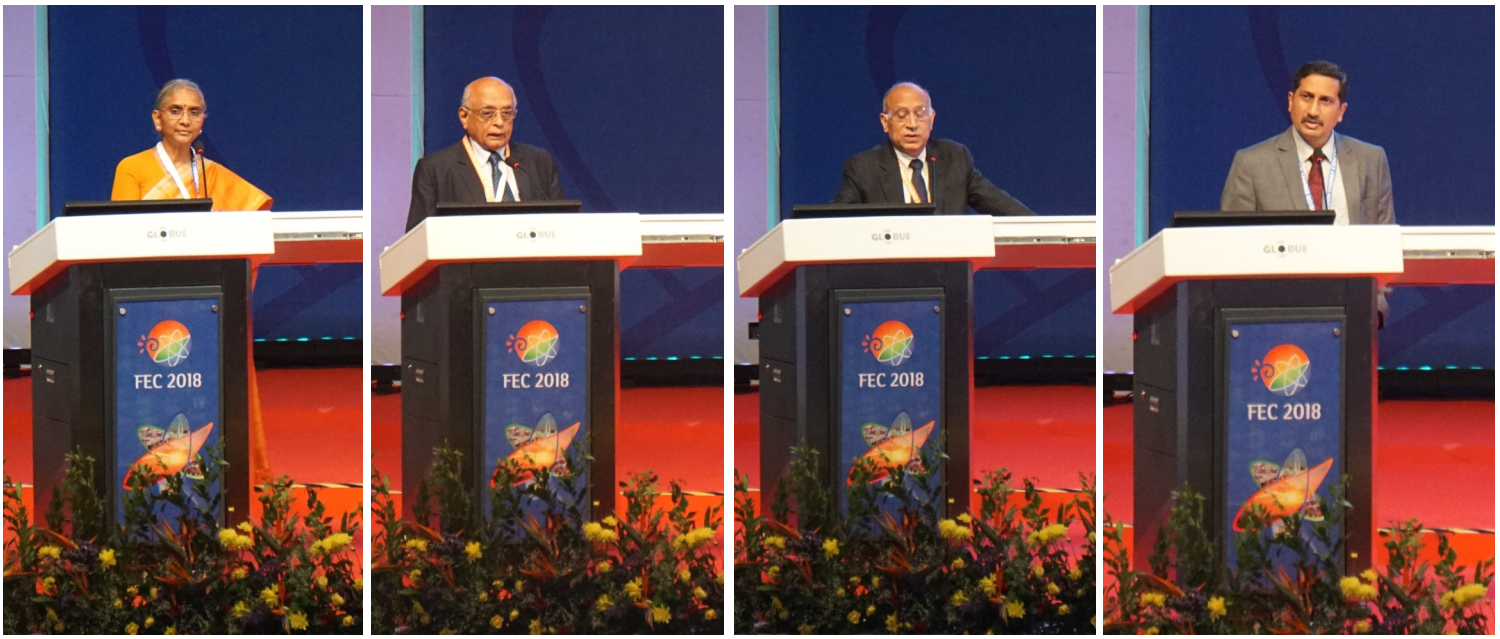
A welcome dinner was organized by the LOC for the participants at Mahatma Mandir on 22nd October and the Conference Banquet was held at the Sabarmati Riverfront park in the evening of 24th October. The participants enjoyed traditional Indian dance forms as well as participated in "*Garba*" wearing traditional Guajarati attire that was provided to them at the venue.

Satellite scientific meetings of various international fusion R&D groups were also held in the sidelines of the conference. During the last session, the summary of all the major sessions were also presented.

The dignitaries on the podium during the inauguration of FEC 2018 (L-R) Dr. Danas Ridikas (IAEA), Dr. Daniel Raju (IPR), Dr. P. A. Child (EURATOM), Dr. R.B. Grover (DAE), Dr. Meera Venkatesh (IAEA), Dr. Shashank Chaturvedi (IPR), Dr. R Chidambaram (AEC), Dr. Shishir Deshpande (ITER-India), Prof. N. K. Prinja (AMEC, UK) and Ms. Sehila M. Gonzales de Vicente (IAEA)

Lighting the traditional lamp during the inauguration of the conference

View of the podium and a section of the audience



(L-R) Dr. Meera Venkatesh, Dr. R. Chidambaram, Dr. R Grover and Dr. S. Deshpande addressing the gathering.

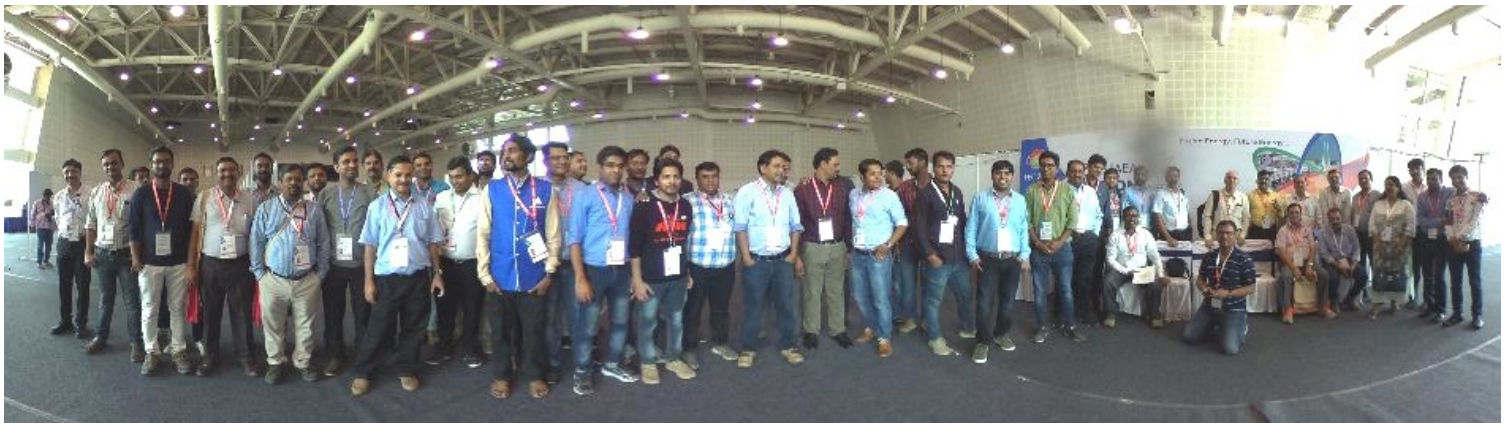
Entrance to the conference venue

Conference Exhibition

Conference registration in progress

The welcome dinner arranged for the participants of FEC 2018 on 22nd October 2018

Poster session in progress



The Local Organizing Committee of FEC

Scientific & casual discussions !

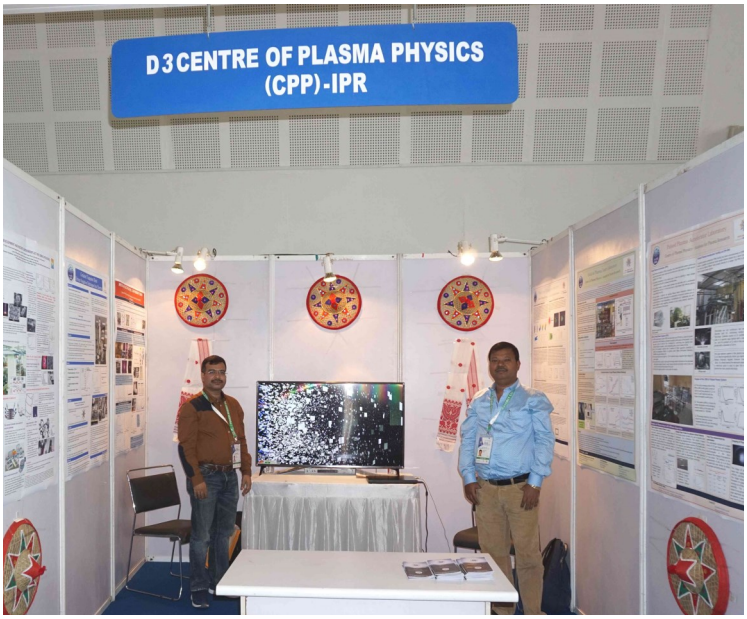








Images of the fun and dance during the Conference Banquet held at Sabarmati Riverfront



Exhibition stalls from IPR, FCIPT, CPP-IPR and ITER-India at the FEC 2018

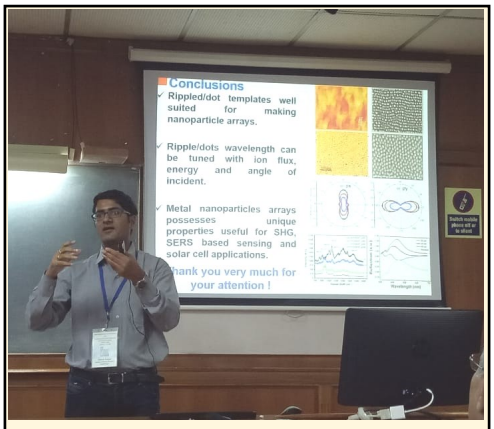
Outreach : IPR Visits

IPR Visits – September, 2018

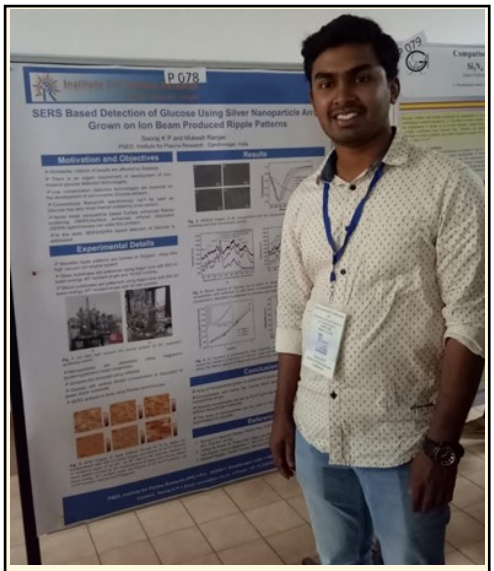
Name Of the Institution	Date	Number of visitors
Sabar Institute of Technology For Girls	25th September 2018	28 Students , Engineering 3rd and 4th Year
Ahmedabad Institute of Technology.	26th September 2018	33 Students Electronics and Communication, 2nd, 3rd and 4th year
Government Engineering Students Bharuch	27th September 2018	55 Students , Mechanical Engineering 3rd Year
Dr. Jivraj Mehta Institute of Technology, Mogar, Anand	10th October 2018	42 Students ,Computer Engineering 3rd Year
Delhi Public School, Bopal , Ahmedabad	11th October 2018	40 Students , SSC

Students from DPS, Bopal Ahmedabad during their visit to IPR

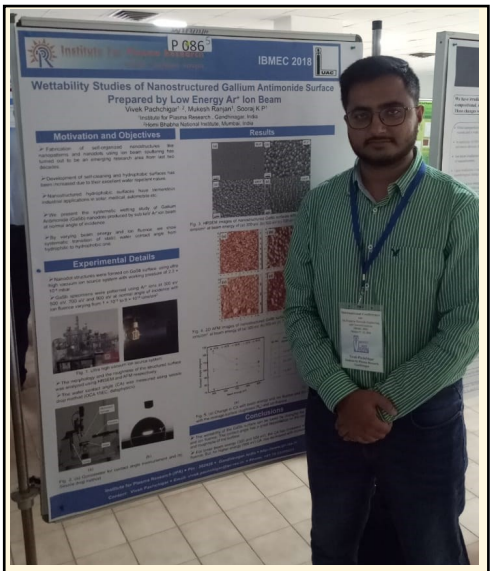
IPR @ Conferences



Dr. Mukesh Ranjan gave an invited talk at SCOP-2018, held at PRL, Ahmedabad during 4-6 Oct, 2018 entitled "*Metal nanoparticles arrays for metamaterial and nanosensor.*" He also delivered an invited lecture on "*Changing Surface Wettability Using Plasma*" at the FLAME-2018 workshop at Amity University, Noida.. He gave an invited talk entitled *"Low Energy Ions for fabrications plasmonic structures for Second Harmonic Generation (SHG) and plasmonic solar cell application"* at the IBMEC-2018, held at IUAC, New Delhi during 9-12 Oct, 2018



Mr. Sooraj K.P. received the best poster award at the Student Conference on Optics and Photonics (SCOP-2018) held at PRL, Ahmedabad during 4-6 Oct, 2018 for his paper title "*Detection of glucose deposited on glass/Si substrates with plasmonic nanoparticles using SERS/SEIRA spectroscopy*."



Mr. Vivek Pachichigar presented a poster entitled *"Wettability Studies of Nanostrctured GaSb Surface prepared by low energy Ar ion beam"* at the International Conference on Ion Beam in Materials Engineering and Characterizations (IBMEC-2018) IBMEC-2018 Conference, held at IUAC, New Delhi during 9-12 Oct, 2018.

IPR Divisions & Groups – High Temperature Technologies Division (HTTD)

"High Temperature Technologies Division" (HTTD) of Institute for Plasma Research (IPR) is primarily involved in R&D activities of high temperature materials and heat removal systems for steady-state and/or transient heat flux, specifically related to Plasma Facing Components of tokamak based plasma confinement devices. HTTD is also involved in R&D areas of destructive & non-destructive testing, diagnostic techniques, characterization & testing of materials and component test facilities relevant to PFCs. (*http://www.ipr.res.in/httd/index.html*). Major activities of HTTD are: (1) Engineering design & analysis of PFCs; (2) Development, characterization and testing of materials, material-joining technologies and components for PFCs; (3) Development and/or Implementation of destructive and non-destructive testing techniques for inspection of materials and components relevant to PFCs. Major facilities available with the division includes: (1) High Heat Flux Test Facility (HHFTF) having 200kW Electron Beam and High Pressure, High Temperature Water Circulation System (HPHT-WCS); (2) Thermo-Mechanical Simulator System (GLEEBLE-3800); (3) Laser Flash Thermal Diffusivity Measurement System; (4) Ultrasonic Flaw Detection System; (5) Precision 3-D Coordinate Measurement System; (6) High Temperature Cavity Blackbody for calibration of Infra-Red equipment; (7) Brazing Furnace with vacuum or inert gas atmosphere.

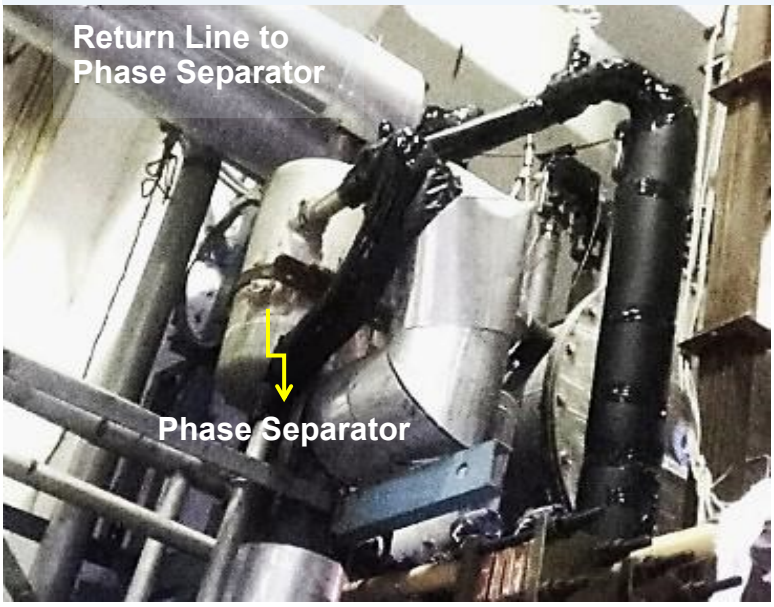
Staff Members of the High Temperature Technologies Division (HTTD) : **Front Row (L-R)**: Rajamannar Swamy, Sunil Belsare, Sudhir Tripathi, Priyanka Patel, Samir Khirwadkar (HoD), K.P. Singh, Kedar Bhope. **Back Row (L-R)**: Vinay Menon, Prakash Mokaria, Mayur Mehta, Tushar Patel, Shailesh Kanpara, Nikunj Patel, Kalpesh Galodiya, Alpesh Patel.

Life @ ITER

Navaratri was celebrated in Manosque on Oct 13, 2018. Around 105 persons including family members of IPR, BARC, TCS, and INOX working at ITER and some local Indians residing in and around Manosque attended this celebration.

Refurbishment of LN2 Phase Separator Hydraulics of 80 K Distribution System of SST-1

In SST-1, sub-cooled LN_2 is used in various sub-systems of 80 K distribution for cooling to reduce the heat load. An in-line gravitational type phase separator is installed to lower the saturation point of LN_2 and ensure delivery of pure liquid to applications. The LN_2 return *via* phase separator of gas and liquid separation process to sub-cooler vessel, the vapour vent is taken out *via* thermally insulated vent lines to atmosphere. The frequent dripping out of LN_2 from the main vent line was observed during SST-1 operation. In order to prevent the losses of LN_2, and addressing the safety of personnel, the problem was analysed and rectified by re-routing the LN_2 distribution and alternate return paths to and from the phase separators. The task required fabrication of transfer lines, vacuum barriers, welding, NDT test, vacuum and helium leak performance test and validation in operating conditions. The thermal insulation installation on 1 inch, 10 m length bare line, heat load calculation were the main aspect of the project task. After this activity, considerable reduction in consumption of LN_2 was observed from 33.6 KL to 24 KL in 24 hours reported from LN_2 tank level SCADA data, which ensures lesser operational costs. The performance of the refurbished system has been validated during 80 K operation, with no leakages and dripping of LN_2 from vent line being observed — *Rajiv Sharma, SST-1 Cryogenic Division.*



(L) Re-routed insulated line to 15 L phase separator (R) LN_2 flow rate measurement in 50 L Dewar

Farewell to Prof. K. S. Goswami

Employees of CPP-IPR bid farewell to its former Centre Director, Prof. K. S. Goswami on 26th September, 2018. Prof. Goswami, who served as the Centre Director from January, 2010 to July, 2018, was a founding faculty member of the erstwhile Centre of Plasma Physics, founded in 1991. Along with its founding director Prof. S. Bujarbarua, Prof. Goswami was instrumental in establishing the Institute's reputation as a leading research institute of northeast India. His most significant contribution is in the area of nonlinear dynamics of plasmas including formation of nonlinear coherent structures like electrostatic electron holes, current free double layers, etc. In the farewell meeting, Dr. B. J. Saikia delivered a short lecture on Prof. Goswami's scientific contributions. Prof. S. Bujarbarua, Prof. B. K. Saikia and other employees recollected their long association with Prof. Goswami. The meeting was also attended by several former students of Prof. Goswami. On behalf of IPR and CPP-IPR, the Newsletter wishes him a happy, healthy and active retired life !

IPR Staff Club Picnic

A Picnic-cum-tour to Saputara was organized for IPR staff and their family members during 29-30 September. Saputara is known for its scenic beauty during the monsoon season is the ideal season to visit this place. A total of 289 people went on this 2-day picnic. Local sightseeing of Saputara town and cultural programs including the "*Dangi*" dance during the evening gala dinner at Shilpi Hill Resort were the highlights of this picnic. It was indeed a memorable weekend for IPR'ites. As part of the programme, this picnic also included visits to Gira waterfalls and Waghai botanical gardens. This picnic was planned and coordinated by IPR Staff Club.

Images from the Staff Club organized picnic to Saputara

Images from the Staff Club organized picnic to Saputara

Past Events

- ***Dr. Saakshi Dhanekar,*** Indian Institute of Technology, New Delhi, gave a talk on "*Nano-materials based sensors for the society*" on 3rd October, 2018
- ***Mr. L. N. Gupta,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Study of inter-winding capacitance of Multi-Secondary Transformer and its effect on the performance of High Voltage Power Supply*" on 4th October, 2018
- ***Ms. Vidhi Goyal,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Experimental study on force balance in thermal plasma torch*" on 4th October, 2018
- ***Dr. Uttam Goswamy,*** Central Electronics Engineering Research Institute (CEERI), Pilani, gave a talk on "Study *of Beam Collector for a High Power and High Efficiency Gyrotron for Fusion Application*" on 5th October, 2018
- ***Dr. A. Saravanan,*** Pondicherry University, Puducherry, India, gave a talk on "*Role of Effective Secondary Electron Emission Coefficient in Glow Discharge Plasmas*" on 12th October 2018
- ***Prof. Spenta R. Wadia,*** International Centre for Theoretical Sciences (ICTS-TIFR), Tata Institute of Fundamental Research, Bangalore, gave a talk on "*Holography, Black Holes and the Sachdev-Ye-Kitaev Model*" on 12th October 2018 (Colloquium #291)
- ***Mr. Prabhakar Srivastav,*** Institute for Plasma Research, Gandhinagar, gave a talk on "*Experimental Study on ETG Turbulence Induced Plasma transport in Large Volume Plasma Device*" on 30th October 2018

Upcoming Events

- Super-Intense Laser-Atom Physics international conference (SILAP-2018), Toronto, Canada, 11-14 December 2018 https://silap2018.physics.utoronto.ca/

Know Our Colleagues

Akhilesh Kumar Singh (SO-C) joined the institute in July 2001 and was assigned to the SST-1 Power System Division. He has contributed individually as well as a team member in the design, procurement, installation, testing, commissioning and operation of coil power supply (TF PS, PF PS and APC PS), AC Systems (132 kV out-door substation, 11 kV indoor substation, 415V Distribution System), Emergency Systems (500 kVA DG Set) and its protection and fault co-ordination for SST-1. He has also carried out conditioning, installation, testing and commissioning of 11 PF converter transformers and their associated bus duct trunking systems. He also contributed in the design and fabrication of copper transition pieces for dc bus elements and carried out installation and erection of dc bus-bar for APC and PF#1 to PF#6 power supply.

He has received training of 6RA70 SIMOREG DC MASTER DRIVE controller and S7-300 PLC being used in PF power supply.

Presently, Akhilesh Singh is engaged in up-gradation of the PF#3 power supply, modification of bus-duct trunking system and validation of electronics of PF converter panels.

Dr. Jyoti Shankar Mishra joined the institute in 2001 in X-ray diagnostic group and presently working as Scientific Officer in Cryopump and injector system division (CISD). During his tenure in X-ray group, he was actively involved in the development, integration, testing of Soft-X ray and Hard X-ray diagnostic system for Aditya and SST-1 tokomak, and analysis of diagnostic data. In 2008, he joined National Institute for Fusion Science (NIFS) PhD program under the MEXT scholarship. During his PhD, he had developed a hydrogen pellet injector and a fast 3D imaging diagnostic. Using the developed instruments, he had studied the pellet ablation process in Large helical Device (LHD). For his work on 3D motion of the pellet ablatant in LHD, he had receive the young researcher award in Japanese scientific conference on plasma and fusion energy. In 2011, he was awarded PhD degree for his thesis titled "*A study of pellet-plasma interaction using fast three-dimensional imaging in large helical device*". Later, he returned to IPR and resumed his work in CISD. He has principally contributed to the development of a hydrogen pellet injection system installed in SST-1 machine. At present he is working on various activities taken up by the division such as pellet injector development and pellet ablation study, cryocooler based cryopumping system, adsorption study and thermal conductivity measurement.

The IPR Newsletter Team

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