PLASMA-2017

32nd National Symposium on Plasma Science & Technology

7-10 November, 2017

Schedule & List Of Abstracts

Institute for Plasma Research, Gandhinagar (Gujarat)

Institute for Plasma Research, Gandhinagar

Facilitation Centre for Industrial Plasma Technologies (FCIPT) , Gandhinagar

Center of Plasma Physics (CPP-IPR) Guwahati

Plasma-2017

32nd National Symposium on Plasma Science & Technology

(Plasma for Societal Benefits)

07-10 November 2017

Conference Schedule

Compiled & Edited by

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Organized by

Plasma Science Society of India
Board of Research in Nuclear Sciences
&
Institute for Plasma Research, Gandhinagar, Gujarat, India

32nd National Symposium on Plasma Science & Technology on
Plasma for Societal Benefits

DISCLAIMER

From The Editors Desk

Dear Friends,

On behalf of the Editorial Board, Local Organizing Committee, PLASMA 2017, we are glad to inform that 32nd National Conference on Plasma Science and Technology is being organized by Plasma Science Society of India (PSSI) and Institute for Plasma Research (IPR) from November 7-10, 2017 at IPR, Gandhinagar. It gives us immense pleasure in writing this message on this occasion.

The theme of this year's conference is "*Plasma for Societal Benefits*". The main objective is to improve the knowledge base and skills through interactive sessions, for addressing issues of concern to our society at this forum over immediate time scales and over times scales of future energy requirements. The scientific content of this conference focuses on how to incorporate the knowledge, expertise and skills developed over diversified spread of plasma science and technology viz., Industrial Applications, Agriculture, Medical Science, Material Development, Space and Defense Applications and in Energy Domains, especially of Fusion Energy. This is an opportunity for young researchers from the field of science and technology to have a good overview of the issues related to this subject.

Delegates attending this year conference will definitely feel the absence of Prof P. K. Kaw, founder director of IPR. His sudden demise is a great loss, not only to the plasma community in India but also to the community worldwide. Young researchers can take a leaf out of his contributions and focus on realizing his dreams for the country.

This year conference will see lectures delivered by the esteemed faculties on variety of fields where plasma science has ventured, covering almost all aspects of plasma science and technology. Besides this, large time is allocated for the poster session, which we believe offers a better platform for enthusiastic students, young research scientists and academicians for serious interactions. We extend our warmest thanks to all authors for their keen interest, enthusiasm and timely submission of abstracts. This year conference will have more than 450 abstracts and probably equal number of delegates.

As editors of abstract book for Plasma 2017, we anticipate that this conference will prove to be of immense value and will be extremely useful to expand the scope of application domain of plasma science and technology. This forum of collection of thoughts will also offer a window for new perspectives and directions in the area of societal benefits of plasma science and technology.

Lastly, we would like to wish all delegates an interactive, knowledge sharing and harmonious PLASMA - 2017.

Foreword

Welcome to the 32nd National Symposium on Plasma Science & Technology which is to be hosted by Institute for Plasma Research, during 07-10 November 2017 at Gandhinagar, Gujarat. The theme for this symposium is *"Plasma for Societal Benefits"*, a topic that is quickly gaining traction in both academic and industrial discussions because of the relevant plasma based solutions to societal issues such as energy, agriculture, healthcare, waste management as well as industry along with nano-technology. This annual event will provide a forum in which the whole plasma community will learn, interact and discuss about their works which should lead to potential research collaborations at various laboratories.

Plasma based technologies have lot of potential to give to the society and thus helping the development of the country. The time has come for PSSI to lead from the front in taking the plasma science to all fronts of country's education from schools to colleges and beyond. We believe that the added advantage of IPR, with exclusive facilities, hosting the symposium will help many young students and researchers to take up the challenge to every part of the country.

The success of this symposium depends completely on the effort, talent, and energy of researchers in the field of Plasma Science and Technology who have written and submitted abstracts for both oral and poster presentations on a variety of topics. The program will be enlightened by Invited Talks also. I thank all those participants sincerely. Praise is also deserved for the Scientific Program Committee members and many others who have invested significant time in putting a commendable program for this symposium.

I would like to encourage each of our members to increase your involvement in PSSI to share your knowledge, skills, and expertise with our community, so that we can all benefit personally and professionally.

My best wishes for the grand success of Plasma 2017.

Prof. Prabal Kumar Chattopadhyay
President, Plasma Science Society of India.

Institute for Plasma Research,
Gandhinagar-382 428, India

Message

I am happy to know that the Plasma Science Society of India is organizing its 32nd National Symposium on Plasma Science and Technology in collaboration with the Institute for Plasma Research during 7- 10 November, 2017 at IPR. This year's conference has special significance since it focuses on applications of Plasma Technology for the benefit of society.

It is well known that plasma science & technology has made major advances over the past few decades. The worldwide effort towards Controlled Thermonuclear Fusion, which has found a focus in the International Thermonuclear Experimental Reactor (ITER) project, is making good progress. There are major technological contributions being made by ITER-India in this project, with Indian deliverables being amongst the first to reach the project Site.

In parallel with the fusion programme is the ever-growing list of plasma applications in industry, agriculture, textile processing, waste disposal, aerospace technologies, plasma stealth systems, plasma thrusters, plasma antennas and so on. These are major challenges for the plasma science community in India. Rapid development & deployment of these technologies in India over the next few years requires a focused and broad-based effort similar to that for the fusion programme.

I would hope that participation in this Symposium would motivate young researchers from different branches of science and engineering to enter these challenging fields.

Lastly, on behalf of IPR, I thank the organizers for their sincere efforts for organizing this symposium and BRNS for its financial support. I extend my best wishes to all the participants and hope that the Symposium will achieve its desired objectives.

Shashank Chaturvedi

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PLASMA – 2017

Conference Schedule (07-10 November, 2017)

	Time	Time	Hrs	Time	Time	Hrs	Time	Time	Hrs	Time	Time	Hrs	Time
	8:00-9:00	9:00-10:15	1h 15m	10:15-10:45	10:45-13:00	2hr 15m	13:00-14:00	14:00-17:00	3 hrs	16:30-17:00	17:00-19:00	2 Hrs	19:30-21:00
DAY-01 07-Nov-2017	registration	**Inaugural Function**	Min	High Tea	**Session - 1 (BP)**	Min	Lunch	**Poster Session – 1 (BP +PU+PP)**		Tea	**Buti Award Presentations**		**Dinner**
		Inauguration	30		S1-I-01 - Invited	30					BYSA-01	20	
		Keynote address	45		S1-I-02 - Invited	30					BYSA-02	20	
					S1-O-01 - Oral	12					BYSA-03	20	
					S1-O-02 - Oral	12					BYSA-04	20	
					S1-O-03 - Oral	12					BYSA-05	20	
					S1-O-04 - Oral	12					BYSA-06	20	
					S1-O-05 - Oral	12							
					D1/S1-Basic Plasma			D1 / P1 (BP + PU + PP)					

	09:00-11:15	2h 15m	11:15-11:30	11:30-13:45		13:40-14:45	14:45-17:45	16:30-17:00	17:45-18:30	18:30-19:30	20:00-21:00
DAY-02 08-Nov-2017	**Session - 2 (NF)**	Min	Tea	**Session - 3 (PP + IP)**	Min	Lunch	**Poster Session – 2 (NF)**	Tea	**Guzdar Award Presentation**	**PSSI-GBM**	**Dinner**
	S2-I-01 - Invited	30		S3-I-01 - Invited	30						
	S2-I-02 - Invited	30		S3-I-02 - Invited	30						
	S2-O-01 - Oral	12		S3-I-03 - Invited	30						
	S2-O-02 - Oral	12		S3-O-01 - Oral	12						
	S2-O-03 - Oral	12		S3-O-02 - Oral	12						
	S2-O-04 - Oral	12		S3-O-03 - Oral	12						
	S2-O-05 - Oral	12			12						
	D2 / S2- Nuclear Fusion						D2 / P2 (NF)				

DAY-03 09-Nov-2017	09:00-11:15	2h 15m	11:15-11:30	11:30-13:45		13:40-14:45	14:45-17:45	16:30-17:00	17:45-19:30	1h 30m	19:30-21:30
	Session - 4 (SA)	Min		**Session - 5 (LP + CM)**	Min				**Session - 6 (EP + PU)**	Min	
	S4-I-01 - Invited	30		S5-I-01 - Invited	30				S6-I-01 - Invited	30	
	S4-I-02 - Invited	30		S5-I-02 - Invited	30				S6-I-02 - Invited	30	
	S4-O-01 - Oral	12		S5-O-01 - Oral	12				S6-O-01 - Oral	30	
	S4-O-02 - Oral	12		S5-O-02 - Oral	12				S6-O-02 - Oral	12	
	S4-O-03 - Oral	12		S5-O-03 - Oral	12				S6-O-03 - Oral	12	
	S4-O-04 - Oral	12		S5-O-04 - Oral	12				S6-O-04 - Oral	12	
	S4-O-05 - Oral	12		S5-O-05 - Oral	12						
	D3 / S4- Space Plasma			**D3 / S5 – Laser Plasma + Computer Modeling**			**D3 / P3 (SA+CM+EP)**		**D3 / S6- Exotic Plasma + Pulsed Power**		

DAY-04 10-Nov-2017	**09:00-12:00**	**11:15-11:30**	**12:00-13:30**	**1 Hr 30 min**	**13:30-14:30**	**14:30-15:30**
	Poster Session – 4 (IP + LP + PD)	**TEA**	**Session - 7 (PD)**		**LUNCH**	**Concluding Session & Award Presentation**
			S7-I-01 - Invited	30		
			S7-I-02 - Invited	30		
			S7-O-01 - Oral	12		
			S7-O-01 - Oral	12		
			S7-O-03 - Oral	12		
			S7-O-04 - Oral	12		
	D4 / P4 – Industrial Plasma + Laser Plasma + Plasma Diagnostics		**D4 / S 7 – Plasma Diagnostics**			

DAY 1 : 07-Nov-2017							
REG	08:00	09:00	Registration				
INAUG	09:00	09:30	Inaugural Function				
KN	09:30	10:15	KN-01	Address by PSSI President			
TEA	10:15	10:45	High Tea				
D1/S-01	**10:45**	**13:00**	**SESSION – 1 : BASIC PLASMA (BP)**			Email	Abs#
S1-I-01	10:45	11:15	Invited - 1	25+5	Dr. Shantanu Karkari, IPR Gandhinagar	skarkari@ipr.res.in	
S1-I-02	11:15	11:45	Invited - 2	25+5	Dr. Kushal Shah, IISER, Bophal	kushals@iiserb.ac.in	
S1-O-01	11:45	12:00	Oral – 1	10+2	Roshan Chalise, Tribhuvan University Nepal	[BP-08; Pg. #10]	40
S1-O-02	12:00	12:15	Oral – 2	10+2	Tania Ghosh, IISER Kolkata	[BP-48; Pg. #56]	91
S1-O-03	12:15	12:30	Oral – 3	10+2	Pallavi Trivedi, IPR Gandhinagar	[BP-22; Pg. #26]	154
S1-O-04	12:30	12:45	Oral – 4	10+2	Sanghamitro Chatterjee, IIT Kanpur	[BP-75; Pg. #86]	424
S1-O-05	12:45	13:00	Oral – 5	10+2	Sarvesh Kumar, IUAC New Delhi	[BP-86; Pg. #99]	480
LUN	13:00	14:00	LUNCH				
D1 / P-01	14:00	17:00	**POSTER – 1 (BP +PU+PP)**				
BYSA	**17:00**	**19:00**	**Buti Young Scientist Award Presentations**				
BYSA-01	17:00	17:20	Buti Award	15+5	Ajay Lotekar, IIG [72/CM-06/BUTI]	Pg. # 117	72
BYSA-02	17:20	17:40	Buti Award	15+5	Niraj Kumar, CEERI [365/PU-04/BUTI]	Pg. # 486	365
BYSA-03	17:40	18:00	Buti Award	15+5	A. Mukherjee, IPR [207/BP-27/BUTI]	Pg. # 32	207
BYSA-04	18:00	18:20	Buti Award	15+5	Harish Charan, IPR [351/EP-12/BUTI]	Pg. # 155	351
BYSA-05	18:20	18:40	Buti Award	15+5	Bivash Dolai, GGCU [26/BP-05/BUTI]	Pg. # 7	26
BYSA-06	18:40	19:00	Buti Award	15+5	Deep Kumar Kuri, Tezpur University [89/LP-10/BUTI]	Pg. # 422	89

DIN	19:30	20:30	DINNER				
DAY 2 : 08-Nov-2017							
D2 / S-02	**09:00**	**11:15**	**SESSION – 2 : NUCLEAR FUSION (NF)**				
S2-I-01	09:00	09:30	Invited - 3	25+5	Dr. S. R. Mohanty, CPP-IPR, Guwahati	smruti@cppipr.res.in	
S2-I-02	09:30	10:00	Invited - 4	25+5	Dr. Joydeep Ghosh, IPR Gandhinagar	jghosh@ipr.res.in	
S2-O-01	10:00	10:15	Oral – 6	10+2	Aroh Srivastava, IPR Gandhinagar	[NF-29; Pg. #229]	62
S2-O-02	10:15	10:30	Oral – 7	10+2	P. V. Subhash, ITER-India	[NF-03; Pg. #197]	136
S2-O-03	10:30	10:45	Oral – 8	10+2	Bibhu Prasad Sahoo, IPR, Gandhinagar	[NF-11; Pg. #208]	318
S2-O-04	10:45	11:00	Oral – 9	10+2	Raghuraj Singh, ITER-India	[NF-67; Pg. #278]	330
S2-O-05	11:00	11:15	Oral – 10	10+2	Harshita Raj, IPR Gandhinagar	[NF-73; Pg. #287]	342
TEA	11:15	11:30	TEA				
D2 / S-03	**11:30**	**13:45**	**SESSION – 3 : INDUSTRIAL PLASMA/ PLASMA PROCESSING (IP+PP)**				
S3-I-01	11:30	12:00	Invited - 5	25+5	Dr. Priyabrata Banerjee, CMERI, Durgapur	priyabratabanerjee16@gmail.com	
S3-I-02	12:00	12:30	Invited - 6	25+5	Dr. T.K. Thiyagarajan, BARC Mumbai	tktrajan@gmail.com	
S3-O-01	12:30	13:00	Invited - 7	25+5	Dr. V. L. Mathe. University of Pune	vlmathe@physics.unipune.ac.in	
S3-O-03	13:00	13:15	Oral – 11	10+2	Divya Deepak G, Mody University of S&T	[PP-01; Pg. #465]	08
S3-O-04	13:15	13:30	Oral – 12	10+2	Nisha Chandwani, IPR Gandhinagar	[IP-04; Pg. #179]	160
S3-O-05	13:30	13:45	Oral – 13	10+2	Krishna Enni, IISU, Trivandrum	[PP-10; Pg. #475]	348
LUN	13:45	14:45	LUNCH				

D2 / PS-02	14:45	17:45	**POSTER SESSION – 02** (NF)
GUZDAR	17:45	18:30	GUZDAR AWARD presentation

GBM	18:30	19:30	**PSSI GBM**				
DIN	20:00		DINNER				

DAY 3 : 09-Nov-2017							
D3 / S-04	**09:00**	**11:15**	**SESSION – 4 : SPACE PLASMA (SA)**				
S4-I-01	09:00	09:30	Invited - 8	25+5	Dr. Kowsik Bodi, IIT Bombay	kbodi@aero.iitb.ac.in	
S4-I-02	09:30	10:00	Invited - 9	25+5	Dr. Durgesh Tripathi, IUCAA, Pune	durgesh@iucaa.in	
S4-O-01	10:00	10:15	Oral - 14	10+2	Ajeet Kumar Maurya, BHU Varanasi	[SA-07; Pg. #507]	39
S4-O-02	10:15	10:30	Oral - 15	10+2	Suktisama Ghosh, IIGM Mumbai	[SA-39; Pg. #543]	180
S4-O-03	10:30	10:45	Oral - 16	10+2	Pralay Karmakar, Tezpur University	[SA-51; Pg. #555]	268
S4-O-04	10:45	11:00	Oral - 17	10+2	Govind Nampoothiri, ISRO, Trivandrum	[SA-14; Pg. #514]	333
S4-O-05	10:45	11:00	Oral - 18	10+2	Ramit Bhattaacharyya, PRL, Ahmedabad	[SA-54; Pg. #558]	370
TEA	11:15	11:30	TEA				
D3 / S-05	**11:30**	**13:45**	**SESSION – 5 : LASER PLASMA + COMPUTER MODELING (LP + CM)**				
S5-I-01	11:30	12:00	Invited - 10	25+5	Dr. A. P. Mishra, V B U, Shantiniketan	apmisra@visva-bharati.ac.in	
S5-I-02	12:00	12:30	Invited - 11	25+5	Dr. Shreekant Barnwal, RRCAT, Indore	sbarnwal@rrcat.gov.in	
S5-O-01	12:30	12:45	Oral - 19	10+2	Raghwendra Kumar, BARC Mumbai	[CM-08; Pg. #119]	108
S5-O-02	12:45	13:00	Oral - 20	10+2	Sowmiya K, Bharathiyar University	[CM-12; Pg. #123]	173
S5-O-03	13:00	13:15	Oral - 21	10+2	Parvathy Nancy, M G University, Kottayam	[LP-39; Pg. #453]	179
S5-O-04	13:15	13:30	Oral - 22	10+2	Ratan Kumar Bera, IPR Gandhinagar	[LP-21; Pg. #434]	217
S5-O-05	13:30	13:45	Oral - 23	10+2	Abdul Kalam S, University of Hyderabad	[LP-42; Pg. #458]	375
LUN	13:45	14:45	LUNCH				

D3 / PS-03	14:45	17:45	**POSTER SESSION – 03** (SA + CM + EP)				
D3 / S-06	**17:45**	**19:30**	**SESSION – 6 : EXOTIC PLASMA + PULSED POWER (EP+ PU)**				
S6-I-01	17:30	18:00	Invited - 12	25+5	Dr. Surendra Prasad, BHU Varanasi	prasads@bhu.ac.in	
S6-I-01	18:00	18:30	Invited - 13	25+5	Dr. Rohit Shukla, BARC Vishakapatanam	rshukla@gmail.com	
S6-O-01	18:30	18:45	Oral - 24	10+2	Manish Kumar Shukla, University of Delhi	[EP-15; Pg. #158]	83
S6-O-02	18:45	19:00	Oral - 25	10+2	Sandeep Kumar, IPR Gandhinagar	[EP-04; Pg. #146]	122
S6-O-03	19:00	19:15	Oral - 26	10+2	Jyotirmoy Pramanik, Kharagpur College	[EP-26; Pg. #173]	265
S6-O-03	19:15	19:30	Oral - 27	10+2	Udit Narayan Pal, CEERI Pilani	[PU-07; Pg. #491]	486
DIN	19:30	21:00	**CULTURAL PROGRAMME + DIRECTOR'S DINNER**				

DAY 4 : 10-Nov-2017							
D4 / PS-04	09:00	12:00	**POSTER SESSION – 04 (IP + LP + PD)**				
D4/S-07	12:00	13:30	**SESSION – 7 : PLASMA DIAGNOSTICS (PD)**				
S7-I-01	12:00	12:30	Invited - 14	25+5	Dr. Divya Oberoi, NCRA-TIFR, Pune	div@ncra.tifr.res.in	
S7-I-02	12:30	13:00	Invited - 15	25+5	Dr. Rajesh Srivastava, IIT Roorkie	rajsrfph@iitr.ac.in	
S7-O-01	13:00	13:15	Oral – 28	10+2	Bajra Mishra, KIIT Bhubaneswar	[PD-32; Pg. #388]	319
S7-O-01	13:15	13:30	Oral – 29	10+2	Suvendu Kumar Dash, Trident Academy, Bhubaneswar	[PD-37; Pg. #393]	328
S7-O-01	13:30	13:45	Oral – 30	10+2	Anuj Ram Baitha, IIT Kanpur	[BP-67; Pg. #77]	367
S7-O-01	13:45	14:00	Oral - 31	10+2	Suman Danani, ITER-India	[PD-46; Pg. #402]	439
LUN	13:30	14:30	LUNCH				
D4 / S-08	14:30	16:00	SESSION – 8 : CONCLUDING SESSION				
AWARDS	15:00	16:00	Distribution OF AWARDS and Concluding remarks				

KEYNOTE ADDRESS

Dr. Anil Bhardwaj, Director PRL

INVITED SPEAKERS

SL	SESSION	SPEAKER	AFFILIATION	E-MAIL	TITLE OF TALK
1	S1-BP	Shantanu Karkari	IPR	skarkari@ipr.res.in	Experiments To Investigate Plasma Sheaths
2	S1-BP	Kushal Shah	IISER, Bhopal	kushals@iiserb.ac.in	Rf Heating And Fermi Accelerators
3	S2-NF	S R Mohanty	CPP-IPR	smruti@cppipr.res.in	Compact Fusion Neutron Sources Based On Inertial Electrostatic Confinement Concept
4	S2-NF	Joydeep Ghosh	IPR	jghosh@ipr.res.in	Recent Results From Aditya Upgrade
5	S3-IP/PP	Priyabrata Banerjee	CMERI, Durgapur	priyabratabanerjee16@gmail.com	Plasma: An Ultimate Solution In Waste Management
6	S3-IP/PP	Kowsik Bodi	IIT Bombay	kbodi@aero.iitb.ac.in	Numerical Simulation Of Electrically Conducting Fluids
7	S3-IP/PP	V. L. Mathe	Univ. Of Pune	vlmathe@physics.unipune.ac.in	Atmospheric Pressure Dielectric Barrier Discharge Plasma For Effective Degradation Of Organic Water Pollutants
8	S4-SA	Tarun Kumar Pant	VSSC	tarun_kumar@vssc.gov.in	Plasma Processes In Near Earth Space : An Emerging Perspective
9	S4-SA	Durgesh Tripathi	IUCAA	durgesh@iucaa.in	Heating And Maintaining The Solar Coronal Plasma To Million Degrees
10	S5-LP/CM	A. P. Mishra	VBU, Shantiniketan	apmisra@visva-bharati.ac.in	Non-Linear Interaction Of Waves In Plasmas : A Simulation Approach
11	S5-LP/CM	Shreekant Barnwal	RRCAT	sbarnwal@rrcat.gov.in	Capillary Discharge Soft X-Ray Laser
12	S6-EP/PU	Surendra Prasad	BHU	prasads@bhu.ac.in	Numerical Modelling Of Surface Modes At The Interface Of Air And Semi-Infinite One Dimensional Plasma Photonic Crystals
13	S6-EP/PU	Rohit Shukla	BARC Vizag	rshukla@gmail.com	Applied Compact Pulsed Power & Diagnostics Development Activities At Barc Visakhapatnam, Atchyutapuram Main Campus
14	S7-PD	Divya Oberoi	NCRA-TIFR	div@ncra.tifr.res.in	Solar Plasma Diagnostics Using Low Radio Frequency Oscillations
15	S7-PD	Rajesh Srivastava	IITR, Roorkie	rajsrfph@iitr.ac.in	Spectroscopic Diagnostic Of Argon And Krypton Plasma Using A C-R Model With Fully Relativistic Electron Impact Cross-Sections

BASIC PLASMA (BP)

COMPUTER MODELING FOR PLASMA (CM)

EXOTIC PLASMA (EP)

INDUSTRIAL PLASMA (IP)

NUCLEAR FUSION (NF)

PLASMA DIAGNOSTICS (PD)

LASER PLASMA (LP)

PLASMA PROCESSING (PP)

PULSED POWER (PU)

SPACE AND ATMOSPHERIC PLASMA (SA)

BOARD OF RESEARCH IN NUCLEAR SCIENCES(BRNS)

The BRNS is an advisory body of the Department of Atomic Energy (DAE) to recommend financial assistance to academic institutions and national laboratories.

Main Activities

1. **Identify and fund R&D projects.**
2. **Financial support to conduct Symposia/Conferences.**
3. **Recruitment under Krishnan Research Associate ship (KSKRA).**
4. **Award research projects under DAE-OIA scheme, through DST-SERC council.**
5. **Award fellowships under DGFS - M.Tech scheme.**
6. **Award fellowships to HBNI students under DGFS- Ph.D. scheme.**
7. **Award fellowships to retired Scientists under RRF-HBC schemes, through AEC.**

Progress in Manufacturing and Shipment to ITER

Progress

The Base Section of the Cryostat (a 30m dia and 30 m tall vacuum vessel) manufactured L&T, Hazira.

Welding operations for final assembly is undergoing at ITER site in France. 6 segments of Cryostat Base section components totalling 1200 tonnes were shipped to ITER

Progress

Neutron shielding blocks manufactured by Avasarala Technologies, Bangalore. About 600 such blocks delivered to Europe and Korea

Progress

Pipe spools dispatched to ITER site in several batches. A novel concept of "pipe-in-pipe" developed to accommodate thermal expansion in buried pipes, the fabrication of which was highly challenging but in the end successfully achieved.

The Ozonators for the ITER Heat Rejection System Shipped to ITER