10th Asia Plasma and Fusion Association Conference (APFA 2015)

Journal of Physics: Conference Series Volume 823

Gandhinagar, India 14 – 17 December 2015

Editors:

Ziauddin Khan Pratibha Semwal

ISBN: 978-1-5108-3962-5 ISSN: 1742-6588 Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2015) by the Institute of Physics All rights reserved. The material featured in this book is subject to IOP copyright protection, unless otherwise indicated.

Printed by Curran Associates, Inc. (2017)

For permission requests, please contact the Institute of Physics at the address below.

Institute of Physics Dirac House, Temple Back Bristol BS1 6BE UK

Phone: 44 1 17 929 7481 Fax: 44 1 17 920 0979

techtracking@iop.org

Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400 Fax: 845-758-2633 Email: curran@proceedings.com Web: www.proceedings.com

Table of contents

Volume 823

10th Asia Plasma and Fusion Association Conference

14-17 December 2015, Institute for Plasma Research (IPR), India

Accepted papers received: 13 March 2017 Published online: 19 April 2017

Preface

011001 OPEN ACCESS 10th Asia Plasma and Fusion Association Conference

011002 OPEN ACCESS Peer review statement

Papers

Invited lectures

012001 OPEN ACCESS Indian Test Facility (INTF) and its updates

M Bandyopadhyay, A Chakraborty, C Rotti, J Joshi, H Patel, A Yadav, S Shah, H Tyagi, D Parmar, Dass Sudhir, A Gahlaut, G Bansal, J Soni, K Pandya, R Pandey, R Yadav, M. V. Nagaraju, V. Mahesh, S. Pillai, D. Sharma, D. Singh, M. Bhuyan, H. Mistry, K Parmar, M. Patel, K Patel, B. Prajapati, H. Shishangiya, M. Vishnudev and J. Bhagora.....1

012002 OPEN ACCESS <u>Upgradation plans of SST-1 Cryogenics system at IPR</u>

V L Tanna, SST-1 Cryo Team and S Pradhan.....7

012003 OPEN ACCESS Improvements in a Tracer-Encapsulated Solid Pellet and Its Injector for More Advanced Plasma Diagnostics

Naoki Tamura, Shigeru Sudo, Chihiro Suzuki, Hisamichi Funaba, Masaru Takagi, Nakahiro Satoh, Hiromi Hayashi, Hiroya Maeno, Mitsuhiro Yokota and Hideki Ogawa.....13

012004 OPEN ACCESS Initial results in SST-1 after up-gradation

S Pradhan, Z Khan, V L Tanna, U Prasad, Y Paravastu, D C Raval, H Masand, Aveg Kumar, J R Dhongde, S Jana, B Kakati, K B Patel, M K Bhandarkar, B K Shukla, D Ghosh, H S Patel, T J Parekh, I A Mansuri, K R Dhanani, A Varadharajulu, Y S Khristi, P Biswas, C N Gupta, S George, P Semwal, D K Sharma, H K Gulati, K Mahajan, B R Praghi, M Banaudha, A R Makwana, H H Chudasma, M Kumar, R Manchanda, Y S Joisa, K Asudani, S N Pandya, S K Pathak, S Banerjee, P J Patel, P Santra, F S Pathan, P K Chauhan, M S Khan, P L Thankey, A Prakash, P N Panchal, R N Panchal, R J Patel, G I Mahsuria, D P Sonara, K M Patel, S P Jayaswal, M Sharma, J C Patel, P Varmora, G L N Srikanth, D R Christian, A Garg, N Bairagi, G R Babu, A G Panchal, M M Vora, A K Singh, R Sharma, H D Nimavat, P R Shah, G Purwar, T Y Raval, A L Sharma, A Ojha, S Kumar, N K Ramaiya, V Siju, M V Gopalakrishna, A Kumar, P K Sharma, P K Atrey, SV Kulkarni, K K Ambulkar, P R Parmar, A L Thakur, J V Raval, S Purohit, P K Mishra, A N Adhiya, U C Nagora, J Thomas, V K Chaudhari, K G Patel, S Dalakoti, C G Virani, S Gupta, Ajay Kumar, B Chaudhari, R Kaur, R Srinivasan, D Raju, D H Kanabar, R Jha, A Das and D Bora.....18

Posters

012005 OPEN ACCESS <u>Wilkinson Type Lumped Element Combiner-Splitter for Indigenous Amplifier</u> <u>Development</u>

Manoj Patel, Akhil Jha, JVS Harikrishna, Rajesh Trivedi and Aparajita Mukherjee.....26

012006 OPEN ACCESS Experience of 12 kA / 16 V SMPS during the HTS Current Leads Test

P Panchal, D Christian, R Panchal, D Sonara, G Purwar, A Garg, H Nimavat, G Singh, J Patel, V Tanna and S Pradhan.....32

012007 OPEN ACCESS Performance of Impedance Transformer for High-Power ICRF Heating in LHD

Kenji Saito, Testuo Seki, Hiroshi Kasahara, Ryosuke Seki, Shuji Kamio, Goro Nomura and Takashi Mutoh.....39

012008 OPEN ACCESS Radio frequency emissions from laser induced material breakdown

Vinoth Kumar, Manikanta Elle and Prem Kiran Paturi.....46

012009 OPEN ACCESS 2D turbulence structure observed by a fast framing camera system in linear magnetized device PANTA

Satoshi Ohdachi, Shigeru Inagaki, Tatsuya Kobayashi and Motoshi Goto.....52

012010 OPEN ACCESS Improving anti-felting characteristics of Merino wool fiber by 2.5 MHz atmosphere pressure air plasma

Nisha Chandwani, Purvi Dave, Vishal Jain, Sudhir Nema and Subroto Mukherjee.....57

012011 OPEN ACCESS <u>A Fixed Frequency Reflectometer to Measure Density Fluctuations at Aditya Tokamak</u>

Praveen Kumar Atrey, Dhaval Pujara and Subroto Mukherjee.....63

012012 OPEN ACCESS Development of heat sink concept for near-term fusion power plant divertor

Sandeep Rimza, Samir Khirwadkar and Karupanna Velusamy.....68

012013 OPEN ACCESS Radiation effects of the laser ablative shockwaves on aluminium under atmospheric conditions

S Sai Shiva, Ch Leela, P Prem Kiran, C D Sijoy and S Chaturvedi.....74

012014 OPEN ACCESS Conceptual design of Dump resistor for Superconducting CS of SST-1

Swati Roy, Piyush Raj, Arun Panchal and Subrata Pradhan.....80

012015 OPEN ACCESS Development, Integration and Testing of Automated Triggering Circuit for Hybrid DC Circuit Breaker

Deven Kanabar, Swati Roy, Chiragkumar Dodiya and Subrata Pradhan.....86

012016 OPEN ACCESS LOFA analysis in helium and Pb-Li circuits of LLCB TBM by FE simulation

Paritosh Chaudhuri, S Ranjithkumar, Deepak Sharma and Chandan Danani.....92

012017 OPEN ACCESS Seismic Design of ITER Component Cooling Water System-1 Piping

Aditya P Singh, Mahesh Jadhav, Lalit K Sharma, Dinesh K Gupta, Nirav Patel, Rakesh Ranjan, Guman Gohil, Hiren Patel, Jinendra Dangi, Mohit Kumar and A G A Kumar.....99

012018 OPEN ACCESS Development of High Voltage and High Current Test Bed for Transmission Line Components

Akhil Jha, Manoj Patel, JVS Harikrishna, P Ajesh, Rohit Anand, Rajesh Trivedi and Aparajita Mukherjee.....105

012019 OPEN ACCESS Solving the Capacitive Effect in the High-Frequency sweep for Langmuir Probe in SYMPLE

Pramila, J J Patel, R Rajpal, C J Hansalia, V P Anitha and K Sathyanarayana....111

012020 OPEN ACCESS The Determination of Plasma Radial Shafranov Shift (ΔR) and Vertical Shift (ΔZ) experimentally using Magnetic probe and Flux loop Method for SST-1 Tokamak

Subrata Jana, Jasraj Dhongde, Harish Masand, Subrata Pradhan and Sameer Kumar....117

012021 OPEN ACCESS Observation of MHD phenomenon for SST-1 superconducting tokamak

Manisha Bhandarkar, Jasraj Dhongde and Subrata Pradhan.....122

012022 OPEN ACCESS <u>Thermal response of actively cooled tungsten monoblocks to inhomogeneous surface heat</u> <u>loading</u>

Y Patil, S S Khirwadkar and D Krishnan....128

012023 OPEN ACCESS Preparation of W/CuCrZr mono-block test mock-up using vacuum brazing technique

K Premjit Singh, S Khirwadkar, Kedar Bhope, Nikunj Patel and Prakash Mokaria.....134

012024 OPEN ACCESS Design and performance of vacuum system for high heat flux test facility

Rajamannar Swamy Kidambi, Prakash Mokaria, Samir Khirwadkar, Sunil Belsare, M S Khan, Tushar Patel and Deepu S Krishnan.....140 012025 OPEN ACCESS Design of a Prototype Positive Ion Source with Slit Aperture Type Extraction System

Sanjeev K Sharma, Prahlad Vattilli, Bhargav Choksi, Bharathi Punyapu, Rambabu Sidibomma, Sridhar Bonagiri, Deepak Aggrawal and Ujjwal K Baruah.....146

012026 OPEN ACCESS Sensitivity analysis of upstream plasma condition for SST-1 X-Divertor configuration with SOLPS

M. Himabindu, Anil K. Tyagi, Deepti Sharma, Devendra Sharma and R. Srinivasan....153

012027 OPEN ACCESS Ponderomotive potential and second harmonic backward Raman scattering in dense quantum plasmas

Nisha Singh Rathore and Punit Kumar.....158

012028 OPEN ACCESS Behaviour of TSI in Magnetized Plasmas for different Plasma Oscillation to Debye Wavelength ratio

Jyoti and Rakhee Malik.....166

012029 OPEN ACCESS Indigenous Manufacturing realization of TWIN Source

R. Pandey, M. Bandyopadhyay, D. Parmar, R. Yadav, H. Tyagi, J. Soni, H. Shishangiya, D. Sudhir Kumar, S. Shah, G. Bansal, K. Pandya, K. Parmar, M. Vuppugalla, A. Gahlaut and A. Chakraborty.....171

012030 OPEN ACCESS Significance of ITER IWS Material Selection and Qualification

Bhoomi K Mehta, Jigar Raval, Abha Maheshwari, Rahul Laad, Gurlovleen Singh and Haresh Pathak.....177

012031 OPEN ACCESS Prototyping of radial plates for fusion relevant superconducting magnets

M Ghate, D Bhavasar, A Panchal, S Udgata and S Pradhan.....184

012032 OPEN ACCESS Assessment of delta ferrite in multipass TIG welds of 40 mm thick SS 316L: A comparative study of ferrite number (FN) prediction and measurements

Ramesh Kumar Buddu, P. M. Raole and B. Sarkar.....189

012033 OPEN ACCESS ITER ECE Diagnostic: Design Progress of IN-DA and the diagnostic role for Physics

H K B Pandya, Ravinder Kumar, S Danani, P Shrishail, Sajal Thomas, Vinay Kumar, G Taylor, A Khodak, W L Rowan, S Houshmandyar, V S Udintsev, N Casal and M J Walsh.....195

012034 OPEN ACCESS Preliminary Design of O-mode Radiometer for ITER ECE Diagnostic

S Danani, H K B Pandya, Ravinder Kumar, M E Austin, V S Udintsev and Vinay Kumar.....201

012035 OPEN ACCESS Development of control system for multi-converter High voltage Power supply using programmable SoC

Rasesh Dave, Jagruti Dharangutti, N P Singh, Aruna Thakar, Hitesh Dhola, Sandip Gajjar, Darshan Parmar, Tanish Zaveri and Ujjwal Baruah.....207

012036 OPEN ACCESS Integration & Validation of LCU with Different Sub-systems for Diacrode based amplifier

Kumar Rajnish, Sriprakash Verma, Dipal Soni, Hriday Patel, Gajendra Suthar, Hrushikesh Dalicha, Hitesh Dhola, Amit Patel, Dishang Upadhayay, Akhil Jha, Manoj Patel, Rajesh Trivedi, Harsha Machchhar, Raghuraj Singh and Aparajita Mukherjee.....213

012037 OPEN ACCESS Design of 1 MHz Solid State High Frequency Power Supply

Darshan Parmar, N P Singh, Sandip Gajjar, Aruna Thakar, Amit Patel, Bhavin Raval, Hitesh Dhola, Rasesh Dave, Dishang Upadhay, Vikrant Gupta, Niranjan Goswami, Kush Mehta and Ujjwal Baruah.....218

012038 OPEN ACCESS Alternate Design of ITER Cryostat Skirt Support System

Manish Kumar Pandey, Saroj Kumar Jha, Girish Kumar Gupta, Avik Bhattacharya, Gaurav Jogi and Anil Kumar Bhardwaj.....226

012039 OPEN ACCESS Development of electromagnetic welding facility of flat plates for nuclear industry

Rajesh Kumar, Subhanarayan Sahoo, Biswanath Sarkar and Anurag Shyam.....232

012040 OPEN ACCESS Electron Beam Welding: study of process capability and limitations towards development of nuclear components

Gautam R Vadolia and K Premjit Singh.....238

012041 OPEN ACCESS <u>Conceptual & Engineering Design of Plug-in Cryostat Cylinder for Super-Conducting</u> Central Solenoid of SST-1

Prabal Biswas, Prosenjit Santra, Kirit Vasava, Snehal Jayswal, Tejas Parekh, Pradeep Chauhan, Hitesh Patel and Subrata Pradhan.....243

012042 OPEN ACCESS Comparative analysis on flexibility requirements of typical Cryogenic Transfer lines

Mohit Jadon, Uday Kumar, Ketan Choukekar, Nitin Shah and Biswanath Sarkar.....250

012043 OPEN ACCESS <u>Thermo-mechanical Design Methodology for ITER Cryodistribution cold boxes</u>

Vinit Shukla, Pratik Patel, Jotirmoy Das, Hitensinh Vaghela, Ritendra Bhattacharya, Nitin Shah, Ketan Choukekar, Hyun-Sik Chang and Biswanath Sarkar.....256

012044 OPEN ACCESS Safety and Environment aspects of Tokamak- type Fusion Power Reactor- An Overview

Bharat Doshi and D. Chenna Reddy.....262

012045 OPEN ACCESS Indigenously developed bending strain setup for I-V characterization of superconducting tapes and wires

Arun Panchal, Anees Bano, Mahesh Ghate, Piyush Raj and Subrata Pradhan.....270

012046 OPEN ACCESS Study of Transport and Micro-structural properties of Magnesium Di-Boride Strand under react and bend mode and bend and react mode

Ananya Kundu, Subrat Kumar Das, Anees Bano and Subrata Pradhan.....276

012047 OPEN ACCESS

Design and Development of CRIO based Data Acquisition and Control system for High Voltage Bushing Experiment

Himanshu Tyagi, Sejal Shah, Ratnakar Yadav, Kartik Patel, Hiren Mistri, Deepak Parmar, Dheeraj Sharma, Mainak Bandyopadhyay and Arun K Chakraborty.....282

012048 OPEN ACCESS Serial Interface through Stream Protocol on EPICS Platform for Distributed Control and Monitoring

Arnab Das Gupta, Amit K Srivastava, S Sunil and Ziauddin Khan.....288

012049 OPEN ACCESS Development of Data Acquisition Set-up for Steady-state Experiments

Amit K Srivastava, Arnab D Gupta, S Sunil and Ziauddin Khan.....295

012050 OPEN ACCESS Manufacturing and assembly of IWS support rib and lower bracket for ITER vacuum vessel

R Laad, Y Sarvaiya, H A Pathak, J R Raval and C H Choi.....301

012051 OPEN ACCESS <u>Assembly & Metrology of First Wall Components of SST-1</u>

Tejas Parekh, Prosenjit Santra, Prabal Biswas, Hiteshkumar Patel, Yuvakiran Paravastu, Snehal Jaiswal, Pradeep Chauhan, Gattu Ramesh Babu, Arun Prakash A, Dhaval Bhavsar, Dilip C Raval, Ziauddin Khan and Subrata Pradhan.....307

012052 OPEN ACCESS Effect of Geometrical Imperfection on Buckling Failure of ITER VVPSS Tank

Saroj Kumar Jha, Girish Kumar Gupta, Manish Kumar Pandey, Avik Bhattacharya, Gaurav Jogi and Anil Kumar Bhardwaj.....313

012053 OPEN ACCESS Preparation and analysis of helium purge gas mixture to be used in Tritium Extraction System of LLCB TBM

V Gayathri Devi, Deepak Yadav and Amit Sircar.....318

012054 OPEN ACCESS Role of Outgassing of ITER Vacuum Vessel In-Wall Shielding Materials in Leak Detection of ITER Vacuum Vessel

A Maheshwari, H A Pathak, B K Mehta, G S Phull, R Laad, M S Shaikh, S George, K Joshi and Z Khan.....323

012055 OPEN ACCESS Preliminary Design Development of ITER X-ray Survey Spectrometer

Sanjeev Varshney, Siddharth Kumar, Sapna Mishra, Namita Yadav, P V Subhush, T S Chaitanya, Shivakant Jha, Vinay Kumar, Robin Barnsley, Philippe Bernascolle, Natalia Casal, Gunter Bertschinger, Stefan Simrock, Jean-Marc Drevon and Michael Walsh.....328

012056 OPEN ACCESS Observation of plasma shift in SST-1 using optical imaging diagnostics

Manoj Kumar, Chesta Parmar, Vishnu Chaudhary and Ajai Kumar.....335

012057 OPEN ACCESS Preliminary Results from Electron Cyclotron Measurements at SST-1

Varsha Siju, Praveena Shukla, Jayesh Raval, Joisa. Y Shankara and S. K. Pathak.....342

012058 OPEN ACCESS Design and Development of Amplitude and phase measurement of RF signal with Digital I-Q Demodulator

Dipal Soni, Kumar Rajnish, Sriprakash Verma, Hriday Patel, Rajesh Trivedi and Aparajita Mukherjee.....347

012059 OPEN ACCESS Design of new central solenoid for SST-1

Upendra Prasad, Subrata Pradhan, Mahesh Ghate, Piyush Raj, V L Tanna, Ziauddin Khan, Swati Roy, Prosenjit Santra, Prabal Biswas, A N Sharma, Yohan Khristi, Deven Kanaber and Pankaj Varmora.....353

012060 OPEN ACCESS Overall behaviour of PFC integrated SST-1 vacuum system

Ziauddin Khan, Dilip C Raval, Yuvakiran Paravasu, Pratibha Semwal, Kalpeshkumar R Dhanani, Siju George, Mohammad Shoaib, Arun Prakash, Gattu R Babu, Prashant Thankey, Firozkhan S Pathan and Subrata Pradhan.....360

012061 OPEN ACCESS Baking and helium glow discharge cleaning of SST-1 Tokamak with graphite plasma facing components

P Semwal, Z Khan, D C Raval, K R Dhanani, S George, Y Paravastu, A Prakash, P Thankey, G Ramesh, M S Khan, P Saikia and S Pradhan.....366

012062 OPEN ACCESS <u>Commissioning and experimental validation of SST-1 plasma facing components</u>

Yuvakiran Paravastu, Dilip Raval, Ziauddin Khan, Hitesh Patel, Prabal Biswas, Tejas Parekh, Siju George, Prosenjit Santra, Gattu Ramesh, A ArunPrakash, Prashant Thankey, Pratibha Semwal, Kalpeshkumar R Dhanani, Snehal Jaiswal, Pradeep Chauhan and Subrata Pradhan.....372

012063 OPEN ACCESS Design and Integration of SMBI System for SST-1 Tokamak

S George, Y Paravastu, M S Khan, K R Dhanani, D C Raval, Z Khan, S Banerjee and S Pradhan.....378

012064 OPEN ACCESS RF assisted Glow Discharge Condition experiment for SST-1 Tokamak

Dilip Raval, Ziauddin Khan, Siju George, Kalpeshkumar R Dhanani, Yuvakiran Paravastu, Pratibha Semwal, Prashant Thankey, Mohammad Shoaib Khan, Bharat Kakati and Subrata Pradhan.....383

012065 OPEN ACCESS Gas Fuelling System for SST-1Tokamak

Kalpesh Dhanani, D C Raval, Ziauddin Khan, Pratibha Semwal, Siju George, Yuvakiran Paravastu, Prashant Thankey, M S Khan and Subrata Pradhan.....388

012066 OPEN ACCESS Nuclear Analyses of Indian LLCB Test Blanket System in ITER

H L Swami, A K Shaw, C Danani and Paritosh Chaudhuri.....394

012067 OPEN ACCESS Quality control of FWC during assembly and commissioning in SST-1 Tokamak

Hitesh Patel, Prosenjit Santra, Tejas Parekh, Prabal Biswas, Snehal Jayswal, Pradeep Chauhan, Yuvakiran Paravastu, Siju George, Pratibha Semwal, Prashant Thankey, Gattu Ramesh, Arun Prakash, Kalpesh Dhanani, D C Raval, Ziauddin Khan and Subrata Pradhan.....400

012068 OPEN ACCESS Measurement of electron energy probability function in weakly magnetized plasma

D Kalita, B Kakati, B K Saikia, M Bandyopadhyay and S S Kausik.....405

012069 OPEN ACCESS Engineering design and integration of in-vessel single turn segmental coil in vacuum vessel of SST-1

Snehal Jayswal, P Chauhan, P Santra, K Vasava, T Perekh, H Patel, P Biswas and S Pradhan....412