

Fusion Science and Technology

CONTENTS / SEPTEMBER 2015—VOL. 68, NO. 2

Proceedings of the
TWENTY-FIRST TOPICAL MEETING ON THE
TECHNOLOGY OF FUSION ENERGY (TOFE-2014)
(Part 1)
Anaheim, California, November 10–13, 2014

v Preface / *Brian D. Wirth, Rajesh Maingi, Vincent Chan*

TECHNICAL PAPERS

- 201** Overview of Fusion Engineering in Japan / *H. Hashizume, T. Nishitani, S. Konishi, Y. Ueda, S. Fukada, A. Sagara*
- 211** Disruption Mitigation System Developments and Design for ITER / *L. R. Baylor, C. C. Barbier, J. R. Carmichael, S. K. Combs, M. N. Ericson, N. D. Bull Ezell, P. W. Fisher, M. S. Lyttle, S. J. Meitner, D. A. Rasmussen, S. F. Smith, J. B. Wilgen, S. Maruyama, G. Kiss*
- 216** High Power Heating and Steady State Operation in the Large Helical Device / *T. Mutoh, K. Nagaoka, H. Takahashi, H. Kasahara, M. Osakabe, S. Kubo, T. Shimozuma, Y. Yoshimura, K. Tsumori, T. Seki, K. Saito, H. Igami, H. Nakano, K. Ikeda, M. Kisaki, R. Seki, S. Kamio, T. Ii, Y. Nakamura, Y. Takeiri, O. Kaneko, LHD Experiment Group*
- 225** The Fusion Nuclear Science Facility, the Critical Step in the Pathway to Fusion Energy / *C. E. Kessel, J. P. Blanchard, A. Davis, L. El-Guebaly, N. Ghoniem, P. W. Humrickhouse, S. Malang, B. J. Merrill, N. B. Morley, G. H. Neilson, M. E. Rensink, T. D. Rognlien, A. F. Rowcliffe, S. Smolentsev, L. L. Snead, M. S. Tillack, P. Titus, L. M. Waganer, A. Ying, K. Young, Y. Zhai*
- 237** Opportunities and Challenges for Compact Fusion Energy / *A. Sykes, A. E. Costley, M. P. Gryaznevich, D. Kingham, J. Hugill, C. Windsor, P. Buxton, J. G. Morgan, B. Huang, G. Hammond, J. Fanthome, G. Smith, S. Ball, S. Chappell, Z. Melhem*
- 245** R&D Needs and Approach to Measure Progress for Liquid Metal Blankets and Systems on the Pathway from Present Experimental Facilities to FNSF / *S. Smolentsev, M. Abdou, N. B. Morley, S. Malang, C. Kessel*
- 251** Blanket/Materials Testing Strategy for FNSF and Its Breeding Potential / *L. El-Guebaly, S. Malang, A. Rowcliffe, L. Waganer*

(Continued)

CONTENTS / SEPTEMBER 2015—VOL. 68, NO. 2

(Continued)

- 259** Present Status of Manufacturing and R&Ds for the JT-60SA Tokamak / *Satoru Higashijima, Yutaka Kamada, Pietro Barabaschi, Hiroshi Shirai, JT-60SA Team*
- 267** Wendelstein 7-X Mechanical Instrumentation System for Commissioning and Operation / *V. Bykov, K. Egorov, J. Fellingner, J. P. Kallmeyer, F. Schauer, M. Gasparotto*
- 272** Analysis of the Wendelstein 7-X Test Divertor Unit Scraper Element with Radiation Shields / *Peter H. Titus, H. Zhang, A. Lumsdaine, W. D. McGinnis, J. Lore, H. Neilson, T. Brown, J. Boscary, A. Peacock, Joris Fellingner*
- 277** PPPL ST-FNSF Engineering Design Details / *T. Brown, J. Menard, L. El Gueblay, A. Davis*
- 282** Study of MHD Corrosion of RAFM Steel in Laminar and Turbulent PbLi Flows in a Wall-Normal Magnetic Field / *Sheida Saeidi, Sergey Smolentsev, Mohamed Abdou*
- 288** Coupling Discrete Element Models of Ceramic Breeder Pebble Beds to Thermofluid Models of Helium Purge Gas Using Volume-Averaged Navier-Stokes and the Lattice-Boltzmann Method / *Jon T. Van Lew, Alice Ying, Mohamed Abdou*
- 295** Vacuum Permeator Analysis for Extraction of Tritium from DCLL Blankets / *Paul W. Humrickhouse, Brad J. Merrill*
- 303** First Operation of the Flinak/LiPb Twin Loop Orosh²l-2 with a 3T SC Magnet for R&D of Liquid Blanket for Fusion Reactor / *Akio Sagara, Teruya Tanaka, Juro Yagi, Mitsutoshi Takahashi, Kuniaki Miura, Takehiko Yokomine, Satoshi Fukada, Shintaro Ishiyama*
- 308** Linear Induction Accelerator with Magnetic Steering for Inertial Fusion Target Injection / *Ronald Petzoldt, Neil Alexander, Lane Carlson, Eric Cotner, Dan Goodin, Robert Kratz*
- 314** Progress in the Understanding of Gridded Inertial Electrostatic Confinement Devices at the University of Wisconsin / *G. L. Kulcinski, J. F. Santarius, G. A. Emmert, R. L. Bonomo, G. E. Becerra, A. N. Fancher, L. M. Garrison, K. B. Hall, M. J. Jasica, A. M. McEvoy, M. X. Navarro, M. K. Michalak, C. M. Schuff*
- 319** Experimental Study of the Propellant Gas Load Required for Pellet Injection with ITER-Relevant Operating Parameters / *S. K. Combs, L. R. Baylor, C. R. Foust, A. Frattolillo, M. S. Lyttle, S. J. Meitner, S. Migliori*
- 326** Neutron Source for Material and Component Tests by Using IFMIF/EVEDA Prototype Accelerator / *T. Nishitani, K. Kondo, S. Ohira, T. Yamanishi, M. Sugimoto, T. Hayashi, K. Ochiai*
- 331** The Impact of Updated Cross Section Libraries on ITER Neutronics Calculation / *Tim D. Bohm, Mohamed E. Sawan*
- 336** Artificial Neural Network Model for the Thermal-Hydraulic Response of a TF Superconducting Magnet in ITER / *Stefano Carli, Roberto Bonifetto, Tiago Pomella Lobo, Laura Savoldi, Roberto Zanino*

(Continued)

CONTENTS / SEPTEMBER 2015—VOL. 68, NO. 2

(Continued)

- 341** Dynamic Simulation-Based Case Study of Fusion on Small-Scale Electrical Grids / *Shutaro Takeda, Satoshi Konishi, Yasushi Yamamoto, Ryuta Kasada, Shigeki Sakurai*
- 346** Tritium Transport Evolutions in HCCR TBM Under ITER Inductive Operations / *Alice Ying, Hongjie Zhang, Mu-Young Anh, Youngmin Lee*
- 353** LOCA Accident for the DEMO Helium Cooled Blanket / *Dario Carloni, Bruno Gonfiotti, Sandro Paci, Lorenzo V. Boccaccini*
- 358** Dynamics for HT and HTO Recovery Through Water Bubbler and CuO Catalyst / *Yasuhisa Oya, Misaki Sato, Kenta Yuyama, Masanori Hara, Yuji Hatano, Masao Matsuyama, Takumi Chikada*
- 362** Quantification of Dominating Factors in Tritium Permeation in PbLi Blankets / *H. Zhang, A. Ying, M. Abdou*
- 368** Direct Delivery of Hydrogen Isotopes from a DU Hydride Bed / *Hongsuk Chung, Jongchul Park, Daeseo Koo, Hyun-Goo Kang, Min Ho Chang, Sei-Hun Yun, Seungyon Cho, Ki Jung Jung, Seungwoo Paek*
- 373** DIII-D Neutral Beam Pole Shields Design Including Copper Plate with Removable Molybdenum Insert / *A. Khodak, P. Titus, I. Zatz, A. Nagy, J. Winkelman, R. Nazikian, T. Scoville*
- 378** Thermal Performance of Multilayer PVD Tungsten Coating for the First Wall Application in Nuclear Fusion Devices / *Hyunmyung Kim, Ho Jung Lee, Changheui Jang*
- 383** Analysis of Cooling for the ITER ECH Waveguide Transmission Line / *Ethan Coffey, Tim Bigelow, Ira Griffith, Greg Hanson, Arnold Lumsdaine, Claire Luttrell, David Rasmussen, Chuck Schaich, Bill Wolframe*
- 388** Diagnostic Twin Screw Extruder: Initial Measurements of Continuous Ne, H₂, and D₂ Extrusions / *J. T. Fisher, J. W. Leachman*
- 392** Fundamental Study of Wave Propagation on Liquid Surface Related IFE Mirror / *Yuji Moriyama, Tomoaki Kunugi, Takehiko Yokomine, Zensaku Kawara, Takayoshi Norimatsu*
- 397** Study on Operation Scenario of Tritium Production for a Fusion Reactor Using a High Temperature Gas-Cooled Reactor / *Yasuko Kawamoto, Hiroyuki Nakaya, Hideaki Matsuura, Kazunari Katayama, Minoru Goto, Shigeaki Nakagawa*
- 402** Analysis of ITER ECH Transmission Line Waveguide Couplings / *Claire Luttrell, Tim Bigelow, Ethan Coffey, Ira Griffith, Greg Hanson, Arnold Lumsdaine, Alex Melin, Chuck Schaich*
- 407** Analysis of ITER Upper Port Diagnostic First Walls / *M. Smith, Y. Zhai, G. Loesser, W. Wang, V. Udintsev, T. Giacomini, A. Khodak, D. Johnson, R. Feder, J. Klabacha*
- 412** Preliminary Neutronics Analysis of the ITER Toroidal Interferometer and Polarimeter Diagnostic Corner Cube Retroreflectors / *K. R. Tresemer, R. Wood, R. Feder, L. Konkel, Jr., J. Klabacha*
- 416** NSTX-U Construction Related Analysis Issues / *Peter H. Titus, L. Dudek, M. Smith, A. Brooks*

(Continued)

CONTENTS / SEPTEMBER 2015—VOL. 68, NO. 2

(Continued)

- 423** Management Strategy for Radioactive Waste in the Fusion DEMO Reactor /
*Youji Someya, Kenji Tobita, Hiroyasu Utoh, Nobuyuki Asakura,
Yoshiteru Sakamoto, Kazuo Hoshino, Makoto Nakamura,
Shinsuke Tokunaga*
- 428** Steady and Transient Thermal Analyses on a Segmented High-Temperature
Superconducting Magnet with Porous Media-Inserted Cryogenic Cooling /
Satoshi Ito, Hidetoshi Hashizume
- 433** Effect of Surface Damage on Thermal Response of Tungsten Monoblocks /
*Yasufumi Tanaka, Heun Tae Lee, Yoshio Ueda, Masayoshi Nagata,
Yusuke Kikuchi, Satoshi Suzuki, Yohji Seki*
- 438** Transient Electromagnetic Analysis of Blanket Modules 14 and 15 in
Different Sectors of the ITER Blanket System due to Plasma Disruption /
Joseph D. Kotulski, Rebecca S. Coats

TECHNICAL NOTES

- 443** Experiment on Recovery of Hydrogen from Fluidized $\text{Li}_{17}\text{Pb}_{83}$ Blanket /
Taiki Muneoka, S. Fukada, R. Yoshimura, K. Katayama, Y. Edao, T. Hayashi
- 448** Design and Fabrication of a DC Feeder System of New TF Magnet Power
Supply for Accelerator-Based In-Situ Materials Surveillance in Alcator
C-Mod / *Lihua Zhou, Rui Vieira, Jeffrey Doody, William Beck, David Terry,
William Cochran, James Irby, Zach Hartwig, Harold Barnard,
Brandon Sorbom, Dennis Whyte*
- 453** Strength Evaluation of HAZ in Electron Beam Welded ARAA by Small Punch
Test for HCCR TBM in ITER / *J. S. Yoon, K. I. Shin, D. W. Lee, S. K. Kim,
H. G. Jin, E. H. Lee, S. Cho, Henry T. Sessions*
- 458** Tritium Desorption Behavior from Soil Exposed to Tritiated Water /
*Kazuya Furuichi, Kazunari Katayama, Hiroyuki Date, Toshiharu Takeishi,
Satoshi Fukada*