

fusiontechnology™

CONTENTS / JULY 1985—VOL. 8, NO. 1
PART 2(A) (pp. 177-1048) and
PART 2(B) (pp. 1049-1919)

Proceedings of the
SIXTH TOPICAL MEETING ON THE TECHNOLOGY
OF FUSION ENERGY
(San Francisco, California, March 3-7, 1985)

xix Comments / *George Miley*

xxi Preface: Sixth Topical Meeting on the Technology of Fusion Energy /
Carl D. Henning

RESULTS FROM THE CURRENT EXPERIMENTAL PROGRAMS

179 Inertial Confinement Fusion Research by GEKKO XII Glass Laser /
C. Yamanaka

189 Progress in Inertial Fusion at LLNL / *Erik Storm*

NEXT-GENERATION DEVICES

201 Objectives and Main Features of the Next European Torus Project /
R. Toschi

206 INTOR—A European View / *Günter Grieger*

214 Status of Fusion Experimental Reactor (FER) Design / *T. Tone, N. Fujisawa,*
M. Sugihara

BLANKET AND FIRST-WALL ENGINEERING

227 The FELIX Experiments: Measurements of Electromagnetic Effects / *L. R.*
Turner, K. Evans, Jr., G. R. Gunderson, S. Kim, M. J. Knott, D. G.
McGhee, W. F. Praeg, R. B. Wehrle

233 Analysis of Magnetomechanical Behavior of Ferromagnetic First Wall Com-
ponent / *K. Miya, T. Rizawa, K. Someya, A. Minato, T. Tone*

239 Structural Responses to Plasma Disruptions in Toroidal Shells / *M. S. Til-*
lack, M. S. Kazimi, L. M. Lidsky

(Continued)

ON THIS COVER

This cover depicts a stylized explanation of fusion energy—power of the sun and the resource from the ocean, working together for fusion energy.

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 245 Simulating the Effects of Plasma Disruption with a 1 MA Current Pulse in a Coaxial Test Fixture / *W. F. Praeg*
- 251 A Liquid Metal Facility for the Analysis of MHD Effects in Fusion-Related Systems / *T. L. Sanders, D. E. Klein, M. E. Crawford*
- 257 Experimental Facility for Studying MHD Effects in Liquid Metal Cooled Blankets / *C. B. Reed, B. F. Picologlou, P. V. Dauzvardis*
- 264 The Influence of Leakage Currents on MHD Pressure Drop / *H. Madarame, K. Taghavi, M. S. Tillack*
- 270 MHD Flow Control as a Design Approach for Self-Cooled Liquid-Metal Blankets of Magnetic Confinement Fusion Reactors / *John S. Walker, Basil F. Picologlou*
- 276 Magnetohydrodynamic Considerations for the Design of Self-Cooled Liquid-Metal Fusion Reactor Blankets / *Basil F. Picologlou*

OPERATIONS AND MAINTENANCE

- 285 Fusion Reactor and Test Cell Configuration / *D. S. Fee*
- 291 Tokamak Fusion Core Experiment Maintenance Study / *Alan M. Snyder, K. D. Watts*
- 296 Operations Analysis of the Unscheduled Summer Machine Opening of the Tokamak Fusion Test Reactor (TFTR) at the Princeton Plasma Physics Laboratory / *M. E. Viola, J. McCann*
- 302 Fusion Power Demonstration (FPD) Maintenance and Disassembly Considerations / *P. T. Spampinato*
- 308 A Comparison of All-Remote and Personnel Access Maintenance Operations for INTOR / *P. T. Spampinato, P. A. Finn, M. Y. Gohar, R. R. Stasko*
- 314 Tokamak Fusion Core Experiment (TFCX) Special-Purpose Remote Maintenance Systems / *L. S. Masson, H. J. Welland*
- 318 Hot Cell Facility Design for Large Fusion Devices / *R. J. Barrett, G. T. Bussell*

POWER REACTOR AND NEXT-GENERATION STUDIES

- 327 System Studies of Commercial Tokamak Reactors with Resistive Magnets / *R. J. LeClaire, R. E. Potok, L. Bromberg, D. R. Cohn, T. F. Yang*
- 332 Tandem Mirror Reactor Power Balance Studies / *G. E. Gorke, L. J. Perkins*
- 338 Spherical Torus: An Approach to Compact Fusion at Low Field—Initial Ignition Assessments / *Y-K. M. Peng, D. J. Strickler, S. K. Borowski, W. R. Hamilton, R. L. Reid, J. R. Haines, V. D. Lee, G. E. Gorke, S. S. Kalsi, B. W. Riemer, E. C. Selcow, G. R. Dalton, G. T. Bussell, J. B. Miller*
- 344 TFCX Current Density and Nuclear Heating Limitations for Superconducting Tokamaks / *Swarn S. Kalsi*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 350 Tandem Mirror Reactor Systems Code (TMRSC) / *R. L. Reid, K. E. Rothe, R. J. Barrett*
- 356 Computerized Cost Estimation Spreadsheet and Cost Data Base for Fusion Devices / *W. R. Hamilton, K. E. Rothe*
- 362 A Computer Code for Tokamak Reactor Concepts Evaluation / *F. Rosatelli, G. Raia*
- 367 Low Power High Wall Loading Tokamak Reactor / *H. M. Attaya, G. A. Emmert, J. F. Santarius, G. L. Kulcinski*

ELECTRICAL AND NUCLEAR COMPONENT DESIGN

- 375 Direct Converter Design for the Fusion Power Demonstration / *I. R. Clarkson, T. E. Luzzi*
- 381 Radio Frequency Vacuum Feedthroughs for High-Power ICRF Heating Applications / *T. L. Owens, F. W. Baity, D. J. Hoffman, J. H. Whealton*
- 387 An Alpha Particle Diagnostic Beam Line System to Generate an Intense Li^0 Beam with an ORNL SITEX Source / *W. K. Dagenhart, W. L. Stirling, C. C. Tsai, J. H. Whealton*
- 392 Material and Electromagnetic Properties of Faraday Shields for Ion Cyclotron Heating Antennas / *D. J. Hoffman, W. R. Becraft, F. W. Baity, J. B. O. Caughman, C. C. Tsai*
- 400 Theory of Feedthroughs: Wave Transmission and Voltage Characteristics of High-Power Current Feeds for ICRH / *J. H. Whealton, R. J. Raridon, D. J. Hoffman, T. L. Owens, M. A. Bell, A. M. Goswitz, F. W. Baity, J. L. Bledsoe, W. R. Becraft*
- 405 Performance Characteristics of a Hall Accelerator with Preionization Discharge (HAPID) / *K. Yoshikawa, H. Tamagaki, M. Ueda, H. Toku, Y. Yamamoto, K. Hirano*
- 411 Experimental Measurements of the Ion Cyclotron Antennas' Coupling and RF Characteristics / *D. J. Hoffman, F. W. Baity, W. R. Becraft, J. B. O. Caughman, T. L. Owens*
- 420 Conceptual Design of a Fast Wave Current Drive (FWCD) Coupler for the PLT / *R. Herbermann, V. Albanese, A. Favale, S. Gralnick, R. Micich, J. Rathke, J. Rose, T. Anderson*

LARGE PROJECTS

- 427 The Mirror Fusion Test Facility (MFTF-B)—Status / *V. N. Karpenko*
- 433 Status of PBFA II for Inertial Confinement Fusion with Light Ions / *J. Pace VanDevender*
- 441 Big Dee—A Flexible Facility Operating Near Breakeven Conditions / *J. L. Luxon, L. G. Davis*
- 450 The Advanced Toroidal Facility (ATF) / *P. B. Thompson*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1 PARTS 2(A) and 2(B)

(Continued)

FUSION BREEDER STUDIES

- 459 An Economic Analysis of Fusion Breeders / *J. G. Delene*
- 465 Design of a Helium-Cooled Molten-Salt Fusion Breeder / *R. W. Moir, J. D. Lee, F. J. Fulton, F. Huegel, W. S. Neef, Jr., A. E. Sherwood, D. H. Berwald, R. H. Whitley, C. P. C. Wong, J. H. DeVan, W. R. Grimes, S. K. Ghose*
- 474 Safety Assessment of the Fusion Breeder / *J. K. Garner, I. Maya*
- 483 Nuclear Performance Optimization of the Be/Li/Th Blanket for the Fusion Breeder / *J. D. Lee, B. R. Bandini*

BLANKET AND FIRST-WALL ENGINEERING

- 491 Status of Fusion Reactor Blanket Evaluation Studies in France / *F. Carré, G. Chevereau, F. Gervaise, E. Proust*
- 501 Status of Blanket and First-Wall Engineering Works in Japan / *Kenji Sumita, Yasushi Seki*
- 511 U.S. Blanket Technology Programs / *R. E. Nygren*

MATERIALS ENGINEERING — BEHAVIOR

- 525 Test Requirements for Solid Breeder Blanket Thermal Behavior / *K. Taghavi, P. Gierszewski*
- 531 A Materials Testing Scenario for a Fusion Reactor / *M. C. Perrin*
- 536 Studies of Corrosion and Impact on Mechanical Properties of SS 304 and 12% Cr Steel by Liquid Lithium / *H. U. Borgstedt, M. Grundmann, J. Konys*
- 541 Corrosion of V 3Ti 1Si in Flowing Lithium / *Ch. Adelhelm, H. U. Borgstedt, J. Konys*
- 546 Lifetime Analysis of Ferritic Steel Structures for High Temperature Fusion Applications / *B. B. Glasgow, W. G. Wolfer*
- 553 Materials Problems for Highly Irradiated ICRH Launchers in Fusion Reactors / *Laila A. El-Guebaly*
- 559 Erosion Tests of Materials by Energetic Particle Beams / *D. E. Schechter, C. C. Tsai, F. Sluss, W. R. Becraft, D. J. Hoffman*
- 565 Nuclear Responses in INTOR Plasma Stabilization Elements / *Y. Gohar, R. F. Mattas, S. Yang, F. W. Wiffen*

ALTERNATIVE FUELS

- 573 The Promise of Tritium Catalyzed Deuterium Tokamaks / *E. Greenspan, G. H. Miley, J. Gilligan, J. Jung*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

BLANKET AND FIRST-WALL ENGINEERING

- 581 Analysis of a Liquid Metal Cooled Blanket Transient Using ATHENA / *P. A. Roth, H. Chow*
- 586 Elastic-Plastic Analysis of Slender First Wall Structures / *G. E. Orient, P. J. Gierszewski, J. K. Garner*
- 592 A Computer Code to Calculate Non-Linear Stresses in a Fusion Reactor / *M. C. Perrin, D. E. Ruester, B. A. Cramer*
- 596 Stress Analysis of a Duplex Structure in a High Heat Flux Fusion Environment / *B. B. Glasgow, W. G. Wolfer*
- 602 Program System for Thermal-Hydraulic and Thermomechanical Design of Fusion Blanket / *S. Niikura, N. Ueda, I. Yanagisawa, T. Tone, Y. Seki*
- 608 NEWLIT—A General Code for Neutron Wall Loading Distribution in Toroidal Reactors / *Hosny M. Attaya, Mohamed E. Sawan*
- 614 Power Flattening in D-T Blankets / *John E. Massidda, Mujid S. Kazimi*
- 619 Optimal Blanket Concepts for D-T Fusion Reactors / *E. Greenspan, A. Kinrot, P. Levin*
- 625 Lifetime Evaluation Study for Fusion Reactor First Wall / *H. Oomura, M. Akiyama, K. Miya*
- 630 Solid Breeder/Structure Mechanical Interaction and Thermal Stability / *Y. Y. Liu, M. C. Billone, K. Taghavi*

PLASMA ENGINEERING

- 637 The Role of Fusion Reaction Products in the Stability of EBT Reactors / *D. Wojtowicz, T. Kammash*
- 641 Analysis of Minority RF Heated Tokamak Plasmas / *T. Houssine Zerguini, Edward F. Splitt, Thomas E. Blue*
- 645 Collisional Pumping for the Production of Intense Spin-Polarized Neutral Beams: Target Considerations / *J. W. Stearns, C. F. Burrell, S. N. Kaplan, R. V. Pyle, L. Ruby, A. S. Schlachter*
- 651 A Generalized Analysis of Power Balance for Fusion Reactors / *J. Reece Roth*
- 657 Confinement Studies in TFTR / *M. Murakami, V. Arunasalam, J. D. Bell, M. G. Bell, M. Bitter, W. R. Blanchard, F. Boody, D. Boyd, N. Bretz, C. E. Bush, J. D. Callen, J. L. Cecchi, R. J. Colchin, J. Coonrod, S. L. Davis, D. Dimock, H. F. Dylla, P. C. Efthimion, L. C. Emerson, A. C. England, H. P. Eubank, R. Fonck, E. Fredrickson, H. P. Furth, L. R. Grisham, S. von Goeler, R. J. Goldston, B. Grek, D. J. Grove, R. J. Hawryluk, H. Hendel, K. W. Hill, R. Hulse, D. Johnson, L. C. Johnson, R. Kaita, J. Kamper-schroer, S. M. Kaye, M. Kikuchi, S. Kilpatrick, H. Kugel, P. H. LaMarche, R. Little, C. H. Ma, D. Manos, D. Mansfield, M. McCarthy, R. T. McCann, D. C. McCune, K. McGuire, D. M. Meade, S. S. Medley, D. R. Mikkelsen,*

(Continued)

CONTENTS / JULY 1985–VOL. 8, NO. 1 PARTS 2(A) and 2(B)

(Continued)

D. Mueller, E. Nieschmidt, D. K. Owens, V. K. Pare, H. Park, B. Prichard, A. Ramsey, D. A. Rasmussen, A. L. Roquemore, P. H. Rutherford, N. R. Sauthoff, J. Schivell, J.-L. Schwob, S. D. Scott, S. Sesnic, M. Shimada, J. E. Simpkins, J. Sinnis, F. Stauffer, B. Stratton, S. Suckewer, G. D. Tait, G. Taylor, F. Tenney, C. E. Thomas, H. H. Towner, M. Ulrickson, R. Wieland, M. Williams, K.-L. Wong, A. Wouters, H. Yamada, S. Yoshikawa, K. M. Young, M. C. Zarnstorff

- 664** Tokamak Arc Damage / *John G. Murray, George E. Gorke*
- 668** Plasma Engineering Models of Tandem Mirror Devices with High-Field Test-Cell Inserts / *M. E. Fenstermacher, R. B. Campbell*
- 674** Physics-Magnetics Trade Studies for Tandem Mirror Reactors / *R. B. Campbell, L. J. Perkins, D. T. Blackfield*
- 680** Plasma Position and Shape for Transient Analysis / *C. E. Kessel, M. A. Firestone, R. W. Conn*
- 685** Plasma Engineering for MINIMARS: A Small Commercial Tandem Mirror Reactor with Octopole Plugs / *L. J. Perkins, B. G. Logan, R. B. Campbell, R. S. Devoto, D. T. Blackfield, B. H. Johnston*

TRITIUM TECHNOLOGY REVIEW

- 693** Tritium Technology Review / *P. A. Finn, D.-K. Sze*

POWER REACTOR STUDIES

- 707** New Directions in Tokamak Reactors / *Charles C. Baker*
- 717** Advances in ICF Power Reactor Design / *William J. Hogan, Gerald L. Kulcinski*
- 727** A Comparison of Burn Cycle Options for Tokamak Reactors / *D. A. Ehst, J. N. Brooks, Y. Cha, K. Evans, Jr., A. M. Hassanein, S. Kim, S. Majumdar, B. Misra, H. C. Stevens*
- 731** Design Studies of Tokamak Power Reactor in JAERI / *T. Tone, M. Nishikawa, Y. Tanaka*
- 741** Advanced Commercial Tokamak Optimization Studies / *R. H. Whitley, D. H. Berwald, J. D. Gordon*
- 747** Design Options for Commercial Reactors with Resistive Magnets / *L. Bromberg*

PLASMA HEATING, IMPURITY CONTROL, AND FUELING

- 759** Technological Issues of Ion Cyclotron Heating of Fusion Plasmas / *D. Q. Hwang, C. M. Fortgang*
- 767** Ion Cyclotron Radio Frequency (ICRF) Heating in Mirrors / *Thomas E. Romesser*

(Continued)

CONTENTS / JULY 1985–VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 779 Poloidal Divertor Systems for Impurity and Particle Control in Ignition Tokamaks / *D. E. Post, R. Mattas*
- 791 The Engineering and Material Aspects of Impurity Control Systems / *J. A. Koski*
- 800 Neutral Beam Heating System for TFTR / *M. D. Williams, H. P. Eubank, L. R. Grisham, J. H. Kamperschroer, H. W. Kugel, G. D. Martin, T. O'Connor, R. E. Prechter, B. A. Prichard, Jr., A. Von Halle, R. A. Winje, K. E. Wright*

MAGNET ENGINEERING

- 807 Partial-Array Test Results in IFSMTF / *J. W. Lue, L. Dresner, K. Koizumi, M. S. Lubell, J. N. Luton, S. S. Shen, G. R. Zahn, J. A. Zichy*
- 817 Experience with Operation of a Large Magnet System in the International Fusion Superconducting Magnet Test Facility / *W. A. Fietz, J. F. Ellis, P. N. Haubenreich, S. W. Schwenterly, R. E. Stamps*
- 823 Comparison of Experimental Results in the Domestic Tests of the Japanese and Euratom-LCT-Coils / *H. Tsuji, S. Shimamoto, A. Ulbricht, P. Komarek, F. Wüchner*
- 829 Design of Aggressive Superconducting TFCX Magnet Systems / *John R. Miller*
- 838 A Demountable Toroidal Field Coil System for a Commercial Tokamak Reactor / *T. F. Yang, R. J. LeClaire, E. S. Bobrov, L. Bromberg, D. R. Cohn, J. E. C. Williams*
- 843 Aspects of the NET Magnet Configurations / *E. Coccolese, N. Mitchell, E. Salpietro*
- 849 Stress Analysis of the NET-II Toroidal Field Coil Based on the SIN Conductor Concept / *C. Marinucci, P. Gillis*
- 856 Electromagnetic and Mechanical Design of RFX Magnetizing Winding / *M. Guarnieri, C. Modena, B. A. Schrefler, A. Stella*
- 862 Conductor Design for NET Toroidal Field Coils / *F. Arendt, R. Flükiger, A. Hofmann, U. Jeske, K.-P. Jüngst, P. Komarek, H. Krauth, W. Lehmann, J. Lühning, B. Manes, W. Maurer, A. Nyilas, W. Specking, P. Türowski*

TRITIUM

- 871 Thermochemical Comparison of the Effectiveness of Protium Purging of Fusion Breeders / *Albert K. Fischer, Carl E. Johnson*
- 875 Modeling of Tritium Transport in Lithium Aluminate Fusion Solid Breeders / *M. C. Billone, R. G. Clemmer*
- 881 Tritium Percolation, Convection, and Permeation in Fusion Solid-Breeder Blankets / *M. C. Billone, Y. Y. Liu*
- 887 Counter Current Extraction System for Tritium Recovery from ^{17}Li - ^{87}Pb / *D. K. Sze*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 891 Tritium Systems Test Assembly Quality Assurance Program / *F. L. Kerstiens*
- 895 Tritium Systems Test Assembly Operator Training Program / *F. L. Kerstiens*
- 898 A Master Assessment Program for Tritium in Air Hazards at Fusion and Tritium Facilities / *T. A. Khan, D. Tom, R. T. Watts*
- 904 A Systematic Methodology for Estimating Direct Capital Costs for Blanket Tritium Processing Systems / *P. A. Finn*
- 911 Tritium System Design for the Mirror Reactors FPD-I, FPD-II, and FPD-III / *P. A. Finn*
- 918 Measuring Nanocurie Quantities of Tritium Bred in Metallic Lithium and Lithium Oxide Samples / *Peter C. Bertone*

MATERIALS ENGINEERING—FABRICATION AND TESTING

- 927 Thermal-Hydraulic/Thermomechanical Testing of Solid Breeder Blanket Modules Using Microwave Energy / *B. Misra, R. E. Nygren, R. B. Poeppel, R. L. Kustom*
- 931 Scale Up of Fabrication of Li₂O Pellets for Lithium Blanket Module (LBM) Application / *L. Yang, R. F. Stetson, W. E. Simpson, J. R. Lindgren*
- 937 Embrittlement of 2¼ Cr-1Mo Steel by Lithium and a Lead-Lithium Liquid / *G. R. Edwards, D. K. Matlock, B. A. Eberhard*

BLANKET AND FIRST-WALL ENGINEERING

- 947 Some Considerations on Li₂O Pebble-Type Breeding Blanket Design for Tokamak Fusion Reactors / *Y. Tanaka, T. Suzuki, S. Mori, S. Yamazaki, M. Misumi, T. Tone, T. Kobayashi, H. Watanabe*
- 953 A Molten Salt Cooling/17Li-83Pb Breeding Blanket Concept / *D. K. Sze, E. T. Cheng*
- 958 A High Performance Tandem Mirror Reactor Blanket / *James K. Garner, James D. Gordon*
- 962 A Module for Testing a Lithium Cooled Tokamak Blanket in a Tandem Mirror Test Reactor / *J. K. Garner, J. Blanchard, G. Orient, K. Taghavi, M. Tilkack, M. Youssef, K. Shin, H. Madarame*
- 968 TFTR Lithium Blanket Module Component Development, Testing and Fabrication / *E. R. Hager, J. R. Lindgren, D. W. Graumann, M. G. Dunlap*
- 974 Subscale Interactive Testing of Fusion Reactor First-Wall/Blanket Components / *David S. Zuckerman, Raymond J. Puigh*
- 980 First Wall and Blanket Design for a High Wall Loading Compact Tokamak Power Reactor / *I. N. Sviatoslavsky, S. I. Abdel-Khalik, M. L. Corradini, L. J. Wittenberg, G. L. Kulcinski, K. Y. Huh, M. El-Afify*
- 986 First Wall and Blanket Concepts for Experimental Fusion Reactors / *G. Casini, M. Biggio, F. Farfaletti-Casali, C. Ponti, M. Rieger, G. Vieider, A. Cardella, W. Daenner*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1 PARTS 2(A) and 2(B)

(Continued)

SHIELDING NEUTRONICS

- 995 Shutdown Dose Rate Studies for TFCX / *B. A. Engholm*
- 1001 Shield Design for Next-Generation, Low-Neutron-Fluence, Superconducting Tokamaks / *V. D. Lee, Y. Gohar*
- 1006 Nuclear Shield Design of a High Beta Ignited Tokamak Experiment / *D. W. Doll, R. D. Blevins, B. A. Engholm, P. Politzer, F. Puhn, L. Sevier*
- 1012 TFCX Shielding Optimization / *S. Yang, Y. Gohar*
- 1020 Shielding Analysis for the Horizontal X-Ray Imaging System on the TFTR / *S. L. Liew, L. P. Ku, J. Kolibal, K. W. Hill*
- 1026 Optimal Shield Concepts for Experimental Fusion Devices / *E. Greenspan, P. Levin, A. Kinrot*
- 1032 Bremsstrahlung Shielding Analysis of the Particle Beam Fusion Accelerator PBFA II / *M. A. Sweeney, J. N. Olsen*
- 1037 Advanced Inboard Shielding Design for Tokamak Fusion Reactors / *Laila A. El-Guebaly, Mohamed E. Sawan*
- 1043 End Cell Shielding and Streaming Analysis of MARS Tandem Mirror Reactor / *Laila A. El-Guebaly*

FUSION BREEDERS

- 1051 Economic Evaluation of Fissile Fuel Production Using Resistive Magnet Tokamaks / *J. C. Doyle, D. R. Cohn, L. M. Lidsky, L. Bromberg*
- 1057 Fusion-Fission Systems with Tritium Producing Fission Reactors / *R. T. Perry, T. A. Parish*
- 1063 The Effect of Self-Shielding of Resonance Cross-Sections on LOTUS Fusion-Fission Device / *S. Pelloni, E. T. Cheng*
- 1067 Parametric Studies on the Neutronics of a Hybrid (Fusion-Fission) Blanket / *P. G. Sedano, J. M. Perlado*

NUCLEAR TECHNOLOGY DEVELOPMENT ISSUES AND NEEDS (FINESSE)

- 1075 Meeting the Technology Needs for a Tokamak DEMO: A Strategy Including Mirror Based Nuclear Test Facilities / *P. Komarek, G. L. Kulcinski*
- 1081 Overview of FINESSE Effort on Fusion Nuclear Technology / *Mohamed A. Abdou*
- 1091 Identification and Characterization of the Key Issues of Fusion Nuclear Technology / *M. Tillack, M. Abdou, D. Berwald, J. Davis, G. Deis, P. Gierszewski, G. Hollenberg, K. Kleefeldt, Y. Liu, D. Morgan, S. Piet, Y. Seki, W. Steele, J. Straalsund*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1 PARTS 2(A) and 2(B)

(Continued)

- 1100** Engineering Scaling and Quantification of the Test Requirements for Fusion Nuclear Technology / *P. Gierszewski, M. Abdou, G. Bell, J. Blanchard, M. Billone, J. Garner, H. Madarame, G. Orient, K. Shin, K. Taghavi, M. Tillack*
- 1109** Interactive Effects and Fluence Goals / *J. L. Straalsund, R. J. Puigh, J. M. Grover, E. K. Opperman, G. W. Hollenburg*
- 1115** Utilization of Fission Reactors for Fusion Engineering Testing / *G. A. Deis, L. G. Miller, M. Youssef*
- 1124** Review of the Potential of Tandem Mirror Reactors as Fusion Engineering Research Facilities / *D. H. Berwald, W. G. Steele, M. E. Fenstermacher, K. Kleefeldt*

BERYLLIUM TECHNOLOGY

- 1137** Historical Perspectives on the Uses and Health Risks of Beryllium / *Otto P. Preuss*
- 1143** Assessment of Beryllium Resources for Fusion Applications / *D. H. Berwald, S. Zenczak*
- 1152** Radiation Damage Experiments and Lifetime Estimates for Beryllium Components in Fusion Systems / *L. G. Miller, J. M. Beeston*
- 1157** An Assessment of Radiation Effects in Beryllium / *W. G. Wolfer, T. J. McCarville*
- 1165** Measurements and Calculations of the Leakage Multiplication from Hollow Beryllium Spheres / *Calvin Wong, E. F. Plechaty, R. W. Bauer, R. C. Haight, L. F. Hansen, R. J. Howerton, T. T. Komoto, J. D. Lee, S. T. Perkins, B. A. Pohl*
- 1174** Thermomechanical Testing of Beryllium for Limiters in ISX-B and JET / *M. F. Smith, R. D. Watson, J. B. Whitley, J. M. McDonald*
- 1184** Studies of Beryllium Dispersion and Toxicology in Fusion Systems / *Mark D. Hoover, Michael D. Allen, Arthur F. Eidson, Allen G. Harmsen*

INERTIAL CONFINEMENT FUSION REACTOR TECHNOLOGY

- 1191** A High Efficiency I.C.F. Driver Employing Magnetically Confined Plasma Rings / *D. J. Meeker, J. H. Hammer, C. W. Hartman*
- 1198** Development of the Cascade Inertial-Confinement-Fusion Reactor / *John H. Pitts*
- 1204** The Pulse* Star Inertial Confinement Fusion Reactor / *J. A. Blink, W. J. Hogan*
- 1208** An ICF Tritium Production Reactor / *W. R. Meier, T. J. McCarville, D. H. Berwald, J. D. Gordon, W. G. Steele*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 1214 Compact Inertial Confinement Fusion Multireactor Concepts / *J. H. Pendergrass*
- 1220 KrF Laser Cost/Performance Model for ICF Commercial Applications / *D. B. Harris, J. H. Pendergrass*

IMPURITY CONTROL AND VACUUM TECHNOLOGY

- 1229 Development of a Continuous Duty Cryopump / *Douglas W. Sedgley, Louis P. Dietz, Nicholas C. Szuchy, Thomas H. Batzer, Wayne R. Call*
- 1235 Calculating the Pumping Speed of Cryopanel: Option to Monte Carlo Methods / *J. Vetrovec*
- 1241 Design of Vacuum Systems for MFTF-B Neutral Beamlines / *J. Vetrovec*
- 1247 Active Beam Dump Module Design for MFTF-B / *J. Weede, J. Vetrovec, H. Beck, J. Chiu, A. Goldner*
- 1253 Neutral Pumping Rates for a Next Step Tokamak Ignition Device / *J. D. Galambos, Y-K. M. Peng, D. Heifetz*
- 1259 Impurity Control and Vacuum Pumping System Design and Analysis for Next-Generation Tokamaks / *John R. Haines*
- 1265 TFTR Bakeout System / *S. Goldfarb, W. Ponton*
- 1269 Self-Sustaining Coatings for Fusion Applications—Copper Lithium Alloys / *A. R. Krauss, D. M. Gruen, J. N. Brooks, M. H. Mendelsohn, R. F. Mattas, A. B. DeWald*
- 1275 Current State of Development and Expected Performance of Copper-Lithium Alloys as an Impurity Control System in Fusion Applications / *J. N. Brooks, D. M. Gruen, A. R. Krauss, R. F. Mattas, A. B. DeWald*
- 1281 Liquid to Gas Leak Ratios with Liquid Nitrogen and Liquid Helium / *Thomas H. Batzer, Wayne R. Call*
- 1284 Cryopumping Hydrogen Isotope Mixtures in MFTF-B with and without Argon Adsorbent / *B. J. Schumacher, W. R. Call*

NEXT-GENERATION DEVICES

- 1291 Compact Minimum Cost Ignition Test Reactor / *D. R. Cohn, E. Bobrov, L. Bromberg, G. Kohse, J. E. C. Williams, R. Witt, T. F. Yang, G. Listvinsky, D. Berwald, G. Bell, C. Wagner*
- 1297 Technical Benefit of an International Project / *C. A. Flanagan*
- 1301 Tokamak Fusion Core Experiment Facilities Functional and Operational Requirements / *J. C. Commander*
- 1306 Evolution of the Fusion Power Demonstration Tandem Mirror Reactor Configuration / *Joseph A. O'Toole, David C. Lousteau*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 1312** Overview of the Fusion Power Demonstration Study / *W. D. Nelson, D. C. Lousteau, J. A. O'Toole, J. N. Doggett, L. J. Perkins, B. G. Logan*
- 1318** Modeling and Optimization of a Test-Cell Upgrade for MFTF-B Operating in the High Neutron Wall Loading Mode / *M. E. Fenstermacher*
- 1324** Modeling and Optimization of Operating Parameters for a Test-Cell Option of the Fusion Power Demonstration-II Tandem Mirror Design / *S. W. Haney, M. E. Fenstermacher*
- 1330** MFTF- α^+ T Shield Design / *Y. Gohar*
- 1339** Analysis of the Key Features of the Demountable Tokamak Fusion Core Concept / *S. Locke Bogart, John A. Dalessandro, Peter Koert, Thomas J. Seed, Daniel L. Vrable, Carl E. Wagner, Carl F. Weggel*
- 1345** HTMR: An Experimental Tokamak Reactor with Hybrid Copper/Superconductor Toroidal Field Magnet / *P. G. Avanzini, G. Raia, F. Rosatelli, V. Zampaglione*
- 1351** A Tokamak Ignition/Burn Experimental Research Device / *C. D. Henning, B. G. Logan, W. L. Barr, R. H. Bulmer, J. N. Doggett, B. M. Johnston, J. D. Lee, R. W. Hoard, D. S. Slack, J. R. Miller*

ENVIRONMENT AND SAFETY

- 1359** A Calculational Methodology for Comparing the Accident, Occupational, and Waste-Disposal Hazards of Fusion Reactor Designs / *Steve Fetter*
- 1367** Qualitative Comparisons of Fusion Reactor Materials for Waste Handling and Disposal / *R. Carroll Maninger*
- 1376** Polonium Aspects Associated with the Use of Lead-Lithium Blankets in Fusion Applications / *N. J. Hoffman, K. A. Murray, J. A. Blink, W. R. Meier, W. F. Vogelsang*
- 1385** Safety Considerations of Lithium Lead Alloy as a Fusion Reactor Breeding Material / *D. W. Jeppson, L. D. Muhlestein*
- 1392** Elemental Volatility of HT-9 Fusion Reactor Alloy / *S. P. Henslee, R. M. Neilson, Jr.*
- 1396** Radioactivity in the Light Ion Fusion Target Development Facility / *D. L. Henderson, R. R. Peterson, G. A. Moses*
- 1402** Low Activation Diagnostic Equipment Design Studies / *G. R. Hopkins, E. T. Cheng, R. K. Fisher*
- 1408** Low Activation Burning Core Reactor Design Studies / *E. T. Cheng, R. L. Creedon, G. R. Hopkins, P. Trester, C. P. C. Wong*
- 1415** Safety Analysis of a Loss-of-Coolant Accident in a Breeding Blanket for Experimental Fusion Reactors / *P. Rocco, V. Renda, L. Papa, G. Pautasso, G. Casini, J. L. Rouyer, H. Djerassi*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1 PARTS 2(A) and 2(B)

(Continued)

BLANKET NEUTRONICS

- 1423 Nuclear Data Needs for Fusion Energy Development / *E. T. Cheng*
- 1431 Nuclear Analysis for the INTOR Array of Loops ICRF Launcher Module Design / *M. E. Sawan*
- 1437 Neutronics Analysis for a High Wall Loading Compact Tokamak Power Reactor / *M. E. Sawan, H. M. Attaya*
- 1443 Neutronics Scaling in Fusion Test Devices / *K. Shin, M. Z. Youssef*
- 1449 The Effectiveness of Building Wall Boration in Controlling the Neutron Responses in a Fusion Facility / *L. P. Ku, J. Kolibal, S. L. Liew*
- 1454 A 14 MeV Neutron Source / *R. T. Perry, T. A. Parish, W. B. Wilson*
- 1460 Measurement of Tritium Production-Rate Distribution in a 60 cm-Thick Li₂O Slab Assembly and Its Analysis / *H. Maekawa, K. Tsuda, Y. Ikeda, Y. Oyama, S. Yamaguchi, M. Nakagawa, T. Fukumoto, A. Hasegawa, T. Mori, Y. Seki, T. Nakamura*
- 1466 Measurements of Induced Activity in Type 316 Stainless Steel by Irradiation in D-T Neutron Fields / *Y. Ikeda, Y. Seki, H. Maekawa, Y. Oyama, T. Nakamura*
- 1472 Neutronic Performance of Heavy Water Slurries as D-T Reactor Blankets / *Michael Schuller, Theodore A. Parish*
- 1477 New Monte Carlo Results for the TFTR/Lithium Blanket Module System / *B. A. Engholm*
- 1484 Operating and Geometrical Arrangement Requirements for Fusion Neutronics Testing / *Yukio Oyama, Mahmoud Z. Youssef, Mohamed A. Abdou*
- 1491 Integral Experiments in a 120-cm Lithium Sphere / *K. Sugiyama, K. Kanda, S. Iwasaki, M. Nakazawa, H. Hashikura, T. Iguchi, H. Sekimoto, S. Itoh, K. Sumita, A. Takahashi, J. Yamamoto*
- 1497 Feasibility of Hands-On Maintenance of the Ion Sources in the NBI of MARS / *Laila A. El-Guebalay*
- 1503 Two-Dimensional TBR Calculations for Conceptual Compact Reversed-Field Pinch Reactor Blanket / *J. W. Davidson, M. E. Battat, D. J. Dudziak*

MUON-CATALYZED FUSION ENGINEERING REVIEW

- 1511 Engineering Issues in Muon-Catalyzed Fusion / *Steven E. Jones*

NEUTRONICS AND SHIELDING

- 1525 Overview of Analytical and Experimental Efforts on Tritium Breeding / *Mohamed A. Abdou*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 1535** Experimental Techniques and Measurement Accuracies / *E. F. Bennett, T. J. Yule, G. Di Iorio, T. Nakamura, H. Maekawa*
- 1542** Neutronics Activities for Next Generation Devices / *Y. Gohar*
- 1552** Status of Methods, Codes and Applications for Sensitivity and Uncertainty Analysis / *Mahmoud Z. Youssef*

ALTERNATIVE CONCEPTS

- 1571** Status of the ZT-40M RFP Experimental Program / *R. S. Massey, R. G. Watt, P. G. Weber, G. A. Wurden, D. A. Baker, C. J. Buchenauer, L. C. Burkhardt, T. Cayton, J. N. DiMarco, J. N. Downing, R. M. Erickson, R. F. Gribble, A. Haberstich, R. B. Howell, J. C. Ingraham, E. M. Little, G. Miller, C. P. Munson, J. A. Phillips, M. M. Pickrell, K. F. Schoenberg, A. E. Schofield, D. M. Weldon*
- 1581** Recent Progress in Stellarator Reactor Conceptual Design / *Ronald L. Miller*
- 1590** Fusion-Power-Core Design of a Compact Reversed-Field Pinch Reactor (CRFPR) / *C. Copenhaver, N. M. Schnurr, R. A. Krakowski, R. L. Hagenson, R. C. Mynard, C. Cappiello, R. E. Lujan, J. W. Davidson, A. D. Chaffee, M. E. Battat*
- 1596** Conceptual Design of a Moving Ring Reactor, KARIN-I / *A. Mohri, Y. Fujii-e, K. Ikuta, H. Momota, H. Naito, Y. Nomura, Y. Tomita, M. Ohnishi, K. Yoshikawa, S. Inoue, M. Nishikawa, S.-Inoue Ito, K. Kitamura, H. Nakashima, S. Nagao, M. Iwamoto, Y. Gomay, M. Kumagai, K. Kawakita, Y. Suzuki, K. Okamoto, H. Matsunaga, S. Yoshizawa*
- 1606** Steady-State Spheromak Reactor Studies / *R. L. Hagenson, R. A. Krakowski*
- 1613** Dense Z-Pinch as a Fusion Power System / *J. D. Sethian, A. E. Robson*
- 1616** A Comparison Study of Toroidal-Field Divertors for a Compact Reversed-Field Pinch Reactor / *C. G. Bathke, R. A. Krakowski, R. L. Miller*

ENVIRONMENT, SITING, AND SAFETY

- 1625** How Safe is Safe Enough? The Relation of Environmental Characteristics and Economic Competitiveness in Fusion-Reactor Design / *John P. Holdren*
- 1631** Issues Relating to the Siting of Tritium-Fueled Fusion Experiments / *Harry J. Reilly, Douglas F. Holland*
- 1637** Fusion Facility Siting Considerations / *G. T. Bussell*
- 1643** Safety Research and Development for Fusion Power Reactors / *William E. Kastenber*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

MAGNET ENGINEERING

- 1651 Optimized Structural Analysis Software for Solenoid Magnets / *Kevin Higgins*
- 1654 Superconducting Joint of the Demountable Helical Coil / *T. Horiuchi, K. Matsumoto, M. Hamada, K. Uo, O. Motojima, M. Nakasuga*
- 1659 Magnetics Calculations for an ELMO Bumpy Square / *R. T. Santoro, N. A. Uckan, R. J. Schmitt*
- 1664 Assessment of Magnetic Field Asymmetries in ELMO Bumpy Square / *T. Uckan, N. A. Uckan*
- 1670 Magnetic Ripple Correction in Tandem Mirrors by Ferromagnetic Inserts / *G. W. Hamilton*
- 1676 A Poloidal Field Coil System for a High Beta Ignited Tokamak Experiment / *J. A. Leuer, S. Ejima, F. J. Helton, J. C. Wesley*
- 1682 Hot Spots in the Inboard Section of the TFCX Toroidal Field Coils / *S. Yang, Y. Gohar*
- 1688 MIG: MCNP Input Generator for EFFI Magnet Geometries / *Hosny Attaya, Yousry Gohar*
- 1693 Development of Superconductor Joint for Helical Coils / *H. Kita, M. Oda, Y. Akutsu, T. Wada, Y. Kazawa, S. Kakiuchi, N. Tada, K. Uo, O. Motojima*
- 1698 Modified 180° Separation Magnet for DIII-BIG DEE Neutral Beam Injectors / *R. Hong, A. P. Colleraine, J. Fasolo, J. Kim, J. Phillips*
- 1703 Octopole Design Concepts for the Mirror End Cell / *Swarn S. Kalsi*
- 1708 Transient Voltage Oscillations in Coils / *P. Chowdhuri*

PLASMA HEATING, IMPURITY CONTROL, AND FUELING

- 1717 Modeling of Non-Gaussian Beamlet Profile Based on Total-Beam Power Loss and Transmission / *J. Kim, L. D. Stewart*
- 1722 FPD Plasma Heating Systems / *S. A. Freije*
- 1729 Engineering Design of the ALT-II Pump Limiter for TEXTOR / *G. W. Brown, J. A. Koski, R. D. Watson*
- 1735 Surface Effects on Sputtered Atoms and their Angular and Energy Dependence / *Ahmed M. Hassanein*
- 1742 A Probabilistic Description of Overpower and Loss of Flow Events and their Impact on Limiter Temperature / *D. L. Sanzo, G. Apostolakis*
- 1748 Development and Testing of Bumper Limiter of Aluminum Alloy Vacuum Vessel for Reacting Plasma Experiment / *T. Uchikawa, M. Fujiwara, R. Nayama, T. Irie, M. Onozuka, M. Tomita, K. Ioki, M. Nishikawa*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1

PARTS 2(A) and 2(B)

(Continued)

- 1754** Impact of a Poloidal Divertor in Ignition Tokamak Design / *D. J. Strickler, Y-K. M. Peng, T. G. Brown, A. E. Dabiri, V. D. Lee, J. B. Miller*
- 1760** Fueling of Fusion Reactors by Means of Pellet Injection / *L. L. Lengyel, K. Borrass*
- 1766** An Impurity Control Test Facility (ICTF) for the Study of Fusion Reactor/Plasma Edge Materials / *J. N. Brooks, R. F. Mattas, D. A. Ehst, N. Hershkowitz*
- 1772** A New Concept for Pumping the Edge Plasma / *W. L. Barr*
- 1774** Plasma Heating Systems Module for TMRSC / *S. A. Freije, R. S. Carson*

POWER CONVERSION, INSTRUMENTATION, AND CONTROL

- 1783** Effects of Pulsed Operation on the Lifetime of Turbine Rotors / *Y. Nakagawa, J. E. Meyer*
- 1789** Plasma Instrumentation for Fusion Power Reactor Control / *G. T. Sager, G. H. Miley, J. F. Baur, I. Maya*
- 1795** Optimal Control Theory Applied to Fusion Plasma Thermal Stabilization / *Glenn Sager, G. H. Miley, I. Maya*
- 1801** Multivariable Current Control for Electrically and Magnetically Coupled Superconducting Magnets / *Earle W. Owen, Daniel W. Shimer*
- 1807** TFTR Plasma Feedback Systems / *R. D. Woolley, M. Bell, J. Coonrod, P. Efthimion, R. J. Hawryluk, W. Hojsak, R. J. Marsala, D. Mueller, W. Rauch, G. D. Tait, G. Taylor, M. Thompson*

INERTIAL CONFINEMENT FUSION REACTORS

- 1815** An ICF Reactor Cavity to Maximize Tritium Breeding / *T. J. McCarville*
- 1820** ICF Reactor Economics: Identifying the High Leverage Design Features / *Wayne R. Meier, William J. Hogan*
- 1826** Blanket Optimization Studies for Cascade / *Wayne R. Meier, Edward C. Morse*
- 1832** High Efficiency Heat Transport and Power Conversion System for Cascade / *I. Maya, R. F. Bourque, R. L. Creedon, K. R. Schultz*
- 1838** Flow Characteristics of the Cascade Granular Blanket / *John H. Pitts, Otis R. Walton*
- 1844** Fragmentation of Suddenly Heated Liquids in ICF Reactors / *James A. Blink, William C. Hoover*
- 1850** Simultaneous Analysis of Neutron Damage, Tritium Generation and Energy Deposition in Different Cavity Designs for ICF Systems / *G. Velarde, J. M. Aragonés, M. C. Gonzalez, P. Hernán, J. J. Honrubia, J. L. Hortal, J. M. Martínez-Val, E. Mínguez, J. L. Ocaña, J. M. Perlado, J. M. Santolaya, J. Sanz*

(Continued)

CONTENTS / JULY 1985—VOL. 8, NO. 1 PARTS 2(A) and 2(B)

(Continued)

- 1856** Thermomechanical Response of ICF Wall Components to Pulsed Heat Flux / *A. H. Wahyono, E. G. Lovell*
- 1861** Inertial Fusion Reactors and Magnetic Fields / *J. B. Cornwell, J. H. Pendergrass*
- 1868** Megajoule-Class Single-Pulse KrF Laser Test Facility as a Logical Step Toward Inertial Fusion Commercialization / *D. B. Harris, J. H. Pendergrass*
- 1872** Design Optimization of Single-Main-Amplifier KrF Laser-Fusion Systems / *D. B. Harris, J. H. Pendergrass*
- 1878** Transport of Light Ion Beams in a High Pressure ICF Reactor / *H. Kislev, B. J. Micklich*
- 1884** Vibration Analysis of LIBRA INPORTs / *R. L. Engelstad, E. G. Lovell*
- 1890** Fatigue Strength Analysis of the Sandia Target Development Facility Reaction Chamber / *R. L. Engelstad, E. G. Lovell, G. A. Moses*
- 1895** Light Ion Fusion Target Development Facility Preliminary Design / *R. R. Peterson, G. A. Moses, R. L. Engelstad, D. L. Henderson, G. L. Kulcinski, E. G. Lovell, M. E. Sawan, I. N. Sviatoslavsky, J. J. Watrous, R. E. Olson, D. L. Cook*
- 1901** A Comparison of Li and ^{83}Pb - ^{17}Li Primary Coolant Designs for the Pulse*Star ICF Reactor / *K. A. Murray, J. J. Corugedo, N. J. Hoffman*

LATE PAPER

- 1909** Tritium Breeding Material: γLiAlO_2 / *B. Rasneur*

DEPARTMENT

- 1915** Author Index