

nuclear technology/FusionTM

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2,
PART 2 (pp. 1-730) and
PART 3 (pp. 731-1518)

**Proceedings of the
FIFTH TOPICAL MEETING ON THE TECHNOLOGY
OF FUSION ENERGY
(Knoxville, Tennessee, April 26-28, 1983)**

- xvii Comments / *George Miley*
xix Preface / *Charles A. Flanagan*

PROGRESS IN FUSION TECHNOLOGY

- 3 Inertial Fusion Program—Present Status / *Sheldon L. Kahalas*
6 The Fusion Technology Program in Japan / *Yasuhiko Iso*
13 The Fusion Programme of the European Community / *D. Palumbo*
20 Progress in Fusion Technology in the U.S. Magnetic Fusion Program /
Robert J. Dowling

U.S. NEXT-GENERATION TOKAMAK AND TANDEM MIRROR PROGRAMS

- 31 Overview of MFAC Panel Findings on Tandem Mirrors and Tokamaks /
J. R. Gilleland
36 Physics Basis for an Ignited Long-Pulse Tokamak / *P. H. Rutherford*
46 Tokamak ETR Objectives, Characteristics, and Critical Issues / *Weston M.
Stacey, Jr.*
56 Next Tokamak Facility / *J. A. Schmidt, C. A. Flanagan*
62 Overview and Direction in the Tandem Mirror Program / *K. I. Thomassen*

(Continued)

ON THIS COVER

This cover is an adaptation of a painting on a wooden stele from the Late Dynastic Period of Ancient Egypt. This adaptation depicts the god Horus with the Knoxville sun sphere above his head. In the original painting, a red sun sphere sat atop his head, symbolizing life, energy, and power. The Knoxville sun sphere was the symbol used on the cover of the abstract book for the Fifth topical.

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 67 Fusion Power Demonstration / *C. D. Henning, B. G. Logan, G. A. Carlson, W. S. Neef, R. W. Moir, R. B. Campbell, R. Botwin, I. R. Clarkson, T. J. Carpenter*

TRITIUM

- 75 The Status of Tritium Technology Development for Magnetic Fusion Energy / *James L. Anderson*
- 83 The TRIO-01 Experiment / *R. G. Clemmer, R. F. Malecha, I. T. Dudley*
- 93 Analysis of the Tritium Requirements for a Power Reactor / *F. Carré, E. Proust, A. Rocaboy*
- 99 The Effects of Tritium Contamination in the FED/INTOR Reactor Hall / *Patricia A. Finn, Michael L. Rogers*
- 106 Tritium Monitoring Requirements of Fusion Reactors and Ontario Hydro Experience: A Comparison / *S. B. Nickerson, R. F. Gerdingh, K. Penfold, D. P. Dautovich*
- 112 Tritium Monitoring Within the Reactor Hall of a DT Fusion Reactor / *Roland A. Jalbert*
- 116 Radiation Catalyzed Conversion of Tritium Gas to Tritiated Water / *C. E. Easterly, M. R. Bennett*
- 121 Tritium Removal from Contaminated Water via Infrared Laser Multiple-Photon Dissociation / *J. L. Maienschein, F. Magnotta, I. P. Herman, F. T. Aldridge, P. Hsiao*

PLASMA ENGINEERING

- 129 Fast Alpha Diffusion and Thermalization in Tokamak Reactors / *S. E. Attenberger, W. A. Houlberg*
- 135 Control for Fusion Thermal Stability / *I. Maya, Hugh D. Campbell*
- 141 Initial Temperature Profiles on the PDX Inner Toroidal Limiter / *M. Ulrickson, H. W. Kugel*
- 146 Parametric Study of LH Current Drive for FED-A / *H. Iida, D. A. Ehst, Y-K. M. Peng*

HYBRIDS AND NONELECTRIC APPLICATIONS

- 155 A Comparison of Fusion Breeder/Fission Client and Fission Breeder/Fission Client Systems for Electrical Energy Production / *R. J. Land, T. A. Parish*
- 161 Thorium Oxide Slurries as Blankets for Fissile Producing Fusion Reactors / *T. C. Geer, T. A. Parish*
- 167 Tritium-Assisted D-D Based Fusion Breeders / *E. Greenspan, G. H. Miley*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 173 Performance Requirements of an Inertial Fusion Energy Source for Hydrogen Production / *Jack Hovingh*
- 178 A Thermochemical Hydrogen Production System Based on a High-Temperature Fusion Reactor Blanket / *I. Maya, K. R. Schultz, J. M. Battaglia, L. C. Brown, E. T. Cheng, R. L. Creedon, D. R. Engler, W. G. Homeyer, M. T. Simnad, P. W. Trester, C. P. C. Wong, R. W. Goodrich, B. K. Jensen, R. Krauss*
- 184 Overview of the HYFIRE Power/Electrolysis Reactor Design / *J. A. Fillo, J. R. Powell, R. Benenati, F. Malick*

OPERATIONS AND MAINTENANCE

- 191 First Plasma Operation of TFTR / *M. D. Machalek*
- 194 Maintenance and Disassembly Considerations for the Technology Demonstration Facility / *P. T. Spampinato*
- 200 TF Coil Replacement Considerations for the FED Baseline Configuration / *L. P. Dietz*
- 206 General Design and Maintenance of TASKA—A Tandem Mirror Test Facility / *A. Suppan, I. N. Sviatoslavsky*
- 212 Application of Mockups to the Resolution of Fusion Reactor Remote Maintenance Design Issues / *L. S. Masson, K. D. Watts*
- 218 Remote Vacuum Joint Concept for Fusion Reactors / *D. W. Doll, E. R. Hager*
- 224 A Remote Joint System for Large Vacuum Ducts / *Dean B. Hagmann, Joel B. Coughlan*
- 230 In-Vessel Maintenance Concepts for Tokamak Fusion Reactors / *J. D. Berger, V. P. Kelly, J. A. Yount*
- 234 Central Cell Blanket Module Maintenance Approach for the MARS High-Temperature Blanket / *N. E. Young, D. Sutliff, D. Tait, R. Siebert, J. Coulahan, J. K. Garner, J. D. Gordon*

ALTERNATE FUELS

- 241 Effects of Enhanced Ion/Electron Equilibration Power on CAT-D Tokamak Ignition / *J. Galambos, G. H. Miley*
- 246 D-D Tokamak Reactor Assessment / *D. C. Baxter, A. E. Dabiri, D. Dobrott, J. E. Glancy, H. Gurol, W. K. Hagan, J. B. McBride, S. Tamor, R. N. Cherdack*
- 252 A D-D Tandem Mirror Reactor with Central-Cell Potential Modification / *G. W. Shuy, D. Dobrott*
- 258 The Influence of Engineering Constraints on Confinement Time Requirements of Advanced Fuel Fusion Reactors / *J. Reece Roth*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 264 High Field Tokamaks with DD-DT Operation and Reduced Tritium Breeding Requirements / *L. Bromberg, D. R. Cohn, E. Bobrov, N. Diatchenko, R. J. LeClaire, J. E. Meyer, J. E. C. Williams*

FUSION SYSTEMS STUDIES

- 273 The Effective Cost of Tritium for Tokamak Fusion Power Reactors with Reduced Tritium Production Systems / *J. G. Gilligan, K. Evans, J. Jung*
- 279 The Development of the Mirror Advanced Reactor Study (MARS) End Plasma Technology System / *R. Herbermann, V. Calia, J. Erickson, S. Fixler, T. Luzzi, D. Sedgley, W. Barr, R. Moir*
- 284 The Availability Analysis of Fusion Power Plants as Applied to MARS / *Zoran Musicki, Charles W. Maynard*
- 290 Utility Evaluation of the DT Starfire and DD Wildcat Reactors / *B. K. Jensen, R. D. Endicott*

LARGE CONSTRUCTION PROJECTS

- 299 JT-60 Project and Its Present Status / *M. Yoshikawa, K. Tomabechi*
- 308 The Mirror Fusion Test Facility: An Intermediate Device to a Mirror Fusion Reactor / *V. N. Karpenko*
- 316 The Joint European Torus (JET) / *D. L. Smart*
- 326 Construction of the Tokamak Fusion Test Reactor / *James W. French, Bernard J. Fedor, Lawrence E. Shaw, Maurice M. Sabado*

ALTERNATE FUELS

- 339 Alternate Fuels in Fusion Reactors / *D. Dobrott*
- 348 Viability of the $^{11}\text{B}(p,\alpha) 2\alpha$ Cycle / *J. D. Gordon, T. K. Samec, S. A. Freije, B. I. Hauss*

NEUTRONICS AND SHIELDING

- 355 Streaming and Shielding Analysis for the NBI System of TDF / *Mohamed E. Sawan*
- 361 Assessments of Tritium Breeding Requirements and Breeding Potential for the STARFIRE/DEMO Design / *J. Jung, M. Abdou*
- 367 Monte Carlo Calculations of Neutron and Gamma-Ray Energy Spectra for Fusion Reactor Shield Design: Comparison with Experiment / *R. T. Santoro, J. M. Barnes*
- 373 Low Cost Shield for Tokamak Fusion Reactors / *Yousry Gohar*
- 381 Monte Carlo Neutronic Analysis for the TFTR Lithium Blanket Module / *B. A. Engholm*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

TRITIUM

- 389 The Wall Tritium Concentration as a Factor in Fusion Reactor Hall Design / *P. A. Finn, R. A. Leonard, M. L. Rogers, C. J. Sienkiewicz*
- 395 Transient Tritium Transport in a Solid Breeder Blanket / *D. R. Hanchar, M. S. Kazimi*
- 401 Some Basic Studies on Tritium Processing in CTR Solid Blanket / *Futaba Ono, Satoru Tanaka, Takayuki Terai, Masahiro Inoue, Masaharu Nakazawa, Yoichi Takahashi, Ryohei Kiyose, Masayoshi Kanno*
- 407 Tritium Recovery from Liquid Lithium-Lead by Vacuum Degassing / *K. E. Plute, E. M. Larsen, L. C. Wittenberg, D. K. Sze*

MATERIALS ENGINEERING

- 415 Waste Management of First Wall and Blanket Structural Materials for Tokamak Fusion Reactors / *S. Vogler, M. J. Steindler, J. Jung*
- 421 Materials Compatibility Considerations for a Fusion-Fission Hybrid Reactor Design / *J. H. DeVan, P. F. Tortorelli*
- 427 Lifetime Analysis of Beryllium Pebbles in a Hybrid Fusion Blanket / *L. G. Miller, J. M. Beeston, P. Y. Hsu, B. L. Harris*
- 433 Comparison Between Measured and Predicted Performance of a High Speed, Free Surface Liquid Jet Flowing Along a Curved Wall / *J. A. Hassberger*
- 439 Analysis of Blanket Structure Lifetime for the Tandem Mirror Hybrid Reactor (TMHR) / *N. M. Ghoniem, D. H. Berwald*

BLANKET AND FIRST WALL ENGINEERING

- 447 MHD Pressure Drop of NaK Flow in Stainless Steel Pipe / *Keiji Miyazaki, Shoji Kotake, Nobuo Yamaoka, Shoji Inoue, Yoichi Fujii-e*
- 453 Disruption Induced Voltages and Loads on Torus Sectors / *R. J. Thome, R. D. Pillsbury, Jr., W. R. Mann*
- 459 Electromagnetic Effects on the FED/INTOR Limiter / *L. R. Turner, M. H. Foss*
- 465 Application of ATHENA to STARFIRE Coolant-Blanket System Analysis / *S. Z. Rouhani, J. L. Jones, B. J. Merrill*
- 471 Effect of Temperature on Magnetic Field Perturbations from the Ferromagnetic Blanket in MARS / *H. Attaya, G. L. Kulcinski*
- 477 Control of Neutron Albedo in Toroidal Fusion Reactors / *B. J. Micklich, D. L. Jassby*
- 483 Critical Heat Flux Enhancement Using Local Tangential Flow Injection / *J. Weede, V. K. Dhir*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

PLASMA ENGINEERING

- 491 Plasma Engineering Analysis of an EBT Reactor Operating Window / *R. T. Santoro, N. A. Uckan, J. M. Barnes*
- 497 Assessment of Energetic Ion Rings Versus Electron Rings for an EBT Reactor / *J. B. McBride, N. A. Uckan, R. J. Kashuba*
- 502 Analysis of Alpha Particle Behavior in EBT Reactors / *M. E. Fenstermacher, N. A. Uckan*
- 507 Transport Scaling Studies for EBT Reactor / *T. Uckan, E. F. Jaeger, N. A. Uckan*
- 513 Plasma Engineering for MARS / *G. A. Carlson, D. E. Baldwin, W. L. Barr, B. M. Boghosian, R. H. Bulmer, R. B. Campbell, R. S. Devoto, G. W. Hamilton, B. M. Johnston, W. N. Kumai, B. G. Logan*
- 519 Particle Confinement in EBT Reactors with Noncircular Mirror Coils / *L. W. Owen, N. A. Uckan*

ENVIRONMENT AND SAFETY

- 527 Risk Considerations for Fusion Energy / *M. S. Kazimi*
- 533 Relative Public Health Effects from Accidental Release of Fusion Structural Radioactivity / *S. J. Piet, M. S. Kazimi, L. M. Lidsky*
- 539 Risk Assessment Techniques for the Evaluation of Tritium Accident Mitigation / *S. Z. Bruske, D. F. Holland*
- 544 Safety Analysis Report for the Tritium Systems Test Assembly / *R. V. Carlson*
- 550 Environment and Safety Major Goals for MARS / *R. C. Maninger*
- 555 Safety Considerations in the Design of the Fusion Engineering Device / *R. J. Barrett*

FUSION SYSTEM STUDIES

- 563 The Mirror Advanced Reactor Study (MARS) / *B. G. Logan*
- 573 Conceptual Design of Fusion Experimental Reactor (FER) / *T. Tone, N. Fujisawa, Y. Seki, H. Iida, K. Tachikawa, M. Sugihara, A. Minato, S. Nishio, T. Yamamoto, K. Kitamura, K. Ueda, S. Saito, R. Shimada, Y. Matsuda, Y. Naruse, S. Shimamoto, S. Tamura, M. Yoshikawa, K. Tomabechi*
- 579 Demonstration Tokamak Power Plant / *M. Abdou, C. Baker, J. Brooks, D. Ehst, R. Mattas, D. Smith, D. DeFreece, G. D. Morgan, C. Trachsel*
- 589 Fusion Breeder Reactor Design Studies / *R. W. Moir, J. D. Lee, M. S. Coops, F. J. Fulton, W. S. Neef, Jr., D. H. Berwald, R. B. Campbell, B. Flanders, J. K. Garner, N. Ghoniem, J. Ogren, Y. Saito, A. Slomovik, R. H. Whitley, K. R. Schultz, G. E. Benedict, E. T. Cheng, R. L. Creedon, I. Maya, V. H. Pierce, J. B. Strand, C. P. C. Wong, J. S. Karbowski, R. P. Rose, J. H. DeVan, P. Tortorelli, L. G. Miller, P. Y. S. Hsu, J. M. Beeston, N. J. Hoffman, D. L. Jassby*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 599 Tokamak Reactor Systems Code / *D. C. Baxter, A. E. Dabiri, J. E. Glancy, W. K. Hagan*
- 603 Superheated Steam Cycle for a D-D Tokamak / *K. C. Lee, R. N. Cherdack*
- 609 Conceptual Design Summary for Modifying Doublet III to a Large Dee-Shaped Configuration / *L. G. Davis, R. Gallix, J. L. Luxon, M. A. Mahdavi, F. A. Puhn, P. J. Rock, J. C. Wesley*
- 615 Influence of Startup, Shutdown and Staged Power Operation on Tandem Mirror Reactor Design / *R. W. Conn, N. M. Ghoniem, S. P. Grotz, F. Najmabadi, K. Taghavi, M. Z. Youssef*

PLASMA HEATING, IMPURITY CONTROL, AND FUELING

- 625 The Technology of Neutral Beam Injection Based on Positive Ion Sources / *Madhavan M. Menon*
- 632 Summary of the Status of Negative-Ion Based Neutral Beams / *William S. Cooper*
- 642 RF Coupler Technology for Fusion Applications / *D. J. Hoffman*
- 647 Radio-Frequency Energy in Fusion Power Generation / *John Q. Lawson, W. R. Becraft, D. J. Hoffman*
- 654 Key Issues of FED/INTOR Impurity Control System / *Mohamed A. Abdou*
- 666 Development of Hydrogen Pellet Injectors at ORNL / *S. K. Combs, S. L. Milora, C. A. Foster, D. D. Schuresko, J. T. Hogan*

TRITIUM

- 677 Implantation Measurements To Determine Tritium Permeation in First Wall Structures / *D. F. Holland, R. A. Causey, M. L. Sattler*
- 681 Gamma Radiation Effects on Tritium Permeation Through Stainless Steel / *G. R. Longhurst, G. A. Deis, P. Y. Hsu, L. G. Miller, R. A. Causey*
- 687 Optimization of a Large-Scale Gas Chromatograph for Separating Tritium and DT from Other H Isotopes / *H. Weichselgartner, H. Frischmuth, J. Perchermeier, A. Stimmelmayer*

MATERIALS ENGINEERING

- 695 Fusion Materials Irradiation Test Facility—A Facility for Fusion Materials Qualification / *A. L. Trego, J. W. Hagan, E. K. Opperman, R. J. Burke*
- 701 The Nuclear Design of a Very Low Activation Fusion Reactor / *E. T. Cheng, G. R. Hopkins*
- 707 Selection and Testing of High Current Contact Materials for Tokamak Devices / *Dennis C. Banker*
- 712 First Wall Coating Candidates for ICF Reactor Chambers Using Dry Wall Protection Only / *D. A. Sink*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 718 Corrosion Behavior of Materials Selected for FMIT Lithium System / *G. D. Bazinet, W. F. Brehm, M. G. Down, D. K. Matlock*
- 724 The Fusion Materials Irradiation Test (FMIT) Facility Lithium System—A Design and Development Status / *P. J. Brackenbury, G. D. Bazinet, W. C. Miller*

BLANKET AND FIRST WALL ENGINEERING

- 733 Flow and Heat Transfer Characteristics in Lithium Loop Under Transverse Magnetic Field / *Keiji Miyazaki, Yoshio Shimakawa, Shoji Inoue, Nobuo Yamaoka, Yoichi Fujii-e*
- 739 A Solid Breeder Blanket and Power Conversion System for the Mirror Advanced Reactor Study (MARS) / *R. Bullis, I. Clarkson, L. Deutsch, R. Micich, M. Rossi, M. Stauber, P. Suh*
- 745 FELIX Construction Status and Experimental Program / *L. R. Turner, W. F. Praeg, M. J. Knott, R. J. Lari, D. G. McGhee, R. B. Wehrle*
- 751 Mechanical and Thermal Design Aspects of the Blanket, and Maintenance Considerations for the Central Cell in MARS / *I. N. Sviatoslavsky, Y. T. Li, D. K. Sze*
- 757 PE-II Scoping Test Results: Solid Breeder Heat Transfer and Stability / *A. R. Veca, L. Yang, P. D. Symolon, K. R. Schultz, C. P. C. Wong*
- 763 FWBS Program Element II: Blanket and Shield Testing / *K. R. Schultz, A. R. Veca, G. A. Deis, P. Y. S. Hsu, R. E. Nygren, H. Herman*
- 769 Limits on Transient Power Variations During Startup and Shutdown of Li-Pb Cooled TMR Blankets / *N. M. Ghoniem, K. Taghavi, J. Blanchard, S. P. Grotz*
- 775 Emergency Cooling of the MARS LiPb Blanket / *D. K. Sze, A. White*
- 780 Thermomechanical Testing of First Wall Test Pieces in ESURF / *J. R. Easoz, R. Bajaj, R. E. Gold, J. W. H. Chi*
- 785 Large Area Surface Heating Facility (ASURF) and Test Program for First Wall Design Concepts / *H. D. Michael, J. Lempert, J. W. H. Chi, R. P. Rose*
- 791 Design and Analysis of the Solid Breeder Integral Simulation Test for PE-II / *G. A. Deis, P. Y. Hsu, K. D. Watts, E. C. Welch*

NEUTRONICS AND SHIELDING

- 799 Fusion Reactor Blanket Neutronic Studies in France / *F. Barré, F. Gerlaise, L. Giancarli*
- 805 Neutronics of a Be-Li-Th Blanket for the Fusion Breeder / *J. D. Lee*
- 811 Aqueous Slurries as Tritium Breeding Blankets for D-T Fusion Reactors / *Theodore A. Parish, Roger D. Erwin, Michael J. Schuller*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 817 A Benchmark Experiment on Tritium Production and Radiation Heating in the LiF Assembly / *T. Iguchi, A. Sekiguchi, M. Nakazawa*
- 823 The Dependence of Neutron-Induced Radioactivity in Fusion Reactors on Geometric Design Parameters / *G. P. Lasche, J. A. Blink*
- 829 Neutronics Analysis of the Modular Stellarator Power Reactor UWTOR-M / *Laila A. El-Guebaly*
- 835 Neutronics Analysis for the MARS Li-Pb Blanket and Shield / *J. H. Huang, M. E. Sawan*
- 841 Cross Section Sensitivity Study for U.S. Fusion Engineering Device (FED) / *S. Pelloni, E. T. Cheng*

INERTIAL CONFINEMENT FUSION

- 849 Vaporization of Pb and Li Films in ICF Reaction Chambers / *A. M. Hassanein, C. D. Croessmann, G. L. Kulcinski*
- 854 Conceptual Design Study on Inertial Confinement Reactor Senri-II / *N. Nakamura, H. Omura, S. Ido, S. Nakai, C. Yamanaka*
- 860 Target Explosion Generated Fireballs in the Nitrogen Filled Target Chamber of the Light Ion Fusion Target Development Facility / *R. R. Peterson, G. A. Moses*
- 866 Inertial Confinement Fusion with Direct Electric Generation by Magnetic Flux Compression / *George Patrick Lasche*
- 872 First Wall Materials Selection in the Light Ion Beam Target Development Facility / *R. R. Peterson, E. G. Lovell, R. L. Engelstad, G. L. Kulcinski, G. A. Moses, K. J. Lee*
- 878 Dynamic Stress Analysis of Light Ion Fusion Target Development Facility Reaction Chambers / *E. G. Lovell, R. L. Engelstad*
- 883 Neutron Activation and Shielding of the Light Ion Fusion Target Development Facility / *K. J. O'Brien, G. A. Moses, A. M. White*
- 889 An ICF Reactor Concept Using ^3He -AFLINT Targets / *G. Miley, J. Stubbins, M. Ragheb, C. Choi, B. Adams, G. Magelssen, R. Martin*

MAGNET ENGINEERING

- 897 Japanese Progress in the Large Coil Task and the High Field Cluster Test Program / *S. Shimamoto, T. Ando, T. Hiyama, H. Tsuji, Y. Takahashi, E. Tada, M. Nishi, K. Yoshida, K. Okuno, K. Koizumi, H. Nakajima, T. Kato, O. Takahashi, M. Oshikiri, F. Iida, K. Yasukochi*
- 906 Manufacture of TFTR Toroidal Field Coils / *E. Stern, R. L. Fuller, A. J. Jarabak, M. Sabado*
- 912 Conceptual Design of Superconducting Helical Coil of Heliotron G / *Shunji Kakiuchi, Yoshiaki Kazawa, Kunishige Kuroda, Hisanao Ogata, Osamu Motojima, Atsuo Iiyoshi, Koji Uo*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 918 Effects of Plasma Elongation on Magnetics of Continuous-Coil Tokamak Reactors / *E. Bobrov, L. Bromberg*
- 924 Progress in Large Superconducting Pulsed Conductors and Coils for the Fusion Experimental Reactor / *S. Shimamoto, T. Ando, T. Hiyama, H. Tsuji, Y. Takahashi, E. Tada, M. Nishi, K. Yoshida, K. Okuno, K. Koizumi, H. Nakajima, T. Kato, O. Takahashi, M. Oshikiri, T. Ogasawara, K. Kuroda, Y. Hattori, O. Osaki, K. Yasukouchi*
- 930 Ohmic Heating Solenoid Design Utilizing Forced Cooled Windings / *Vishnu C. Srivastava*
- 936 Poloidal Field Superconducting Ring Coil Case and Support Structure Design / *R. J. Hooper, B. L. Hunter*

INERTIAL CONFINEMENT FUSION

- 945 Repetitive Pulsed Power Technology for Inertial Confinement Fusion / *K. R. Prestwich, M. T. Buttram*
- 955 Novette Pulse Power System Description / *D. G. Gritton, D. J. Christie, R. W. Holloway, B. T. Merritt, J. A. Oicles, K. Whitham, R. B. Wilcox*
- 961 Light Ion Fusion Target Development Facility Pre-Conceptual Design / *G. A. Moses, R. R. Peterson, R. L. Engelstad, E. G. Lovell, G. L. Kulcinski, K. J. O'Brien, A. M. White, J. J. Watrous, D. L. Cook*
- 967 Cascade: A Centrifugal-Action Solid-Breeder Reaction Chamber / *John H. Pitts*
- 973 Design Considerations for Direct-Illumination-Driven Inertial Fusion Reactors / *Jack Hovingh*
- 979 The SCEPTRE High-Temperature Reactor Concept for Inertial Fusion / *M. J. Monsler, W. R. Meier*
- 985 A Success Oriented ICF R&D Plan for Commercial Demonstration by 2010 / *W. Steele, J. Maniscalco, J. Gordon, S. Salem, T. McCarville, D. Berwald*

IMPURITY CONTROL AND VACUUM TECHNOLOGY

- 993 Divertor Target Design for the UWTOR-M Modular Stellarator Power Reactor / *R. Sanders, I. N. Sviatoslavsky*
- 998 Engineering Design of the MARS Interim Halo Plasma Scraper / *J. Erickson, T. Luzzi, D. Sedgley*
- 1004 FED Pumped Limiter Configuration Issues / *J. R. Haines, G. M. Fuller*

NEXT-GENERATION DEVICES

- 1013 A Long-Pulse Ignited Test Experiment (LITE) / *L. Bromberg, D. Cohn, J. E. C. Williams, D. L. Jassby, M. Okabayashi*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 1019 Design of the Alcator DCT Tokamak at MIT / *J. H. Schultz, D. B. Montgomery*
- 1025 Driven Current Tokamak (DCT) Scoping Study / *R. L. Reid*
- 1031 Desirable Engineering Features of the Next-Generation Tokamak Device / *T. G. Brown, C. A. Flanagan*
- 1037 Alternative Technological Pathways for Tokamak Fusion / *G. Gibson, D. A. Sink, L. Green*
- 1043 Engineering Testing Requirements in FED/INTOR / *M. A. Abdou, R. E. Nygren, G. D. Morgan, C. A. Trachsel, E. Opperman, R. Puigh, G. Wire, R. Gold*
- 1052 FED-R: A Fusion Engineering Device Utilizing Resistive Magnets / *D. L. Jassby, S. S. Kalsi*

BLANKET AND FIRST WALL ENGINEERING

- 1061 Mechanical Design and Thermal Hydraulic Considerations for a Self-Cooled Lithium-Lead Blanket / *B. Misra, D. L. Smith, R. C. Burk, G. D. Morgan*
- 1067 The Gas-Cooled Li₂O Moderator/Breeder Canister Blanket for Fusion-Synfuels / *Richard W. Werner, M. A. Hoffman*
- 1073 Fusion Breeder Blanket Design Considerations / *C. P. C. Wong, R. L. Creedon, I. Maya, K. R. Schultz*
- 1079 Design of Superheated Steam Producing Blanket for a D-D Tokamak / *A. E. Dabiri, J. E. Glancy, H. Gurol, R. N. Cherdack*
- 1084 Fluidized Bed Design for ICF Reactor Blankets Using Solid Lithium Compounds / *E. W. Sucov, F. S. Malick, L. Green, B. O. Hall*
- 1089 A Neutron-Transparent First Wall for Module Testing / *G. M. Fuller, B. A. Cramer, J. R. Haines, J. Kirchner, B. A. Engholm, M. Seki*
- 1095 An Electrically Conducting First Wall for the Fusion Engineering Device-A (FED-A) Tokamak / *B. A. Cramer, G. M. Fuller, J. R. Haines, V. D. Lee, F. W. Wiffen, Y. Gohar*
- 1101 Conceptual Study of a Lithium Lead Eutectic Blanket for a Power Reactor / *F. Carré, Z. Tilliette, J. Remoleur, E. Proust*
- 1107 Economic Design Optimization of the LiPb Blanket for the Mirror Advanced Reactor (MARS) / *L. J. Perkins, G. L. Kulcinski*

ENVIRONMENT AND SAFETY

- 1115 Modeling of Fusion Activation Product Release and Reactor Damage from Rapid Structural Oxidation / *S. J. Piet, M. S. Kazimi, L. M. Lidsky*
- 1121 Pressurized-Water Cooling Tube Ruptures in a Fusion Blanket / *Paul A. Roth, J. Stephen Herring*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 1127 Cost Optimization of Tritium Control Systems / *D. F. Holland*
- 1131 High Temperature Oxidation and Mobilization of Activated Structural Species / *S. P. Henslee*
- 1135 On the Development of Accident Sequences Involving Tokamak Impurity Control Systems / *A. Madrid, G. Apostolakis, R. W. Conn*
- 1141 Alternative Dispositions for Irradiated Superconducting Magnet Materials / *I. Maya, H. E. Levine, D. D. Peterman, S. Strausberg, K. R. Schultz*
- 1146 The Influence of Steel Type on the Activation and Decay of Fusion Reactor First Walls / *J. A. Blink, G. P. Lasche*
- 1152 Safety and Environment Tritium Problems in a Tokamak Reactor, Optimization of Workers and Public Protection and the Robotics Challenge / *D. Leger, J. L. Royer, J. Vertut*

NEUTRONICS AND SHIELDING

- 1159 EBT-P Gamma Ray Shielding Analysis / *Yousry Gohar*
- 1165 Measurements of Angular Flux on Surface of Li₂O Slab Assemblies and Their Analysis by a Direct Integration Transport Code "BERMUDA" / *Hiroshi Maekawa, Yukio Oyama, Tomoo Suzuki, Yujiro Ikeda, Tomoo Nakamura*
- 1171 MARS Axicell Radiation Damage and Shielding Analysis / *Laila El-Guebaly, L. John Perkins, Charles Maynard*
- 1177 On Isotopic Tailoring for Fusion Reactor Radioactivity Reduction / *Mahmoud Z. Youssef, R. W. Conn*
- 1183 Neutron Activation in EBT-P / *D. E. Driemeyer*
- 1189 Intercomparison of Nuclear Data Library Sources, Group Structures and Collapsing Spectra for INTOR-EC / *S. Pelloni, J. Stepanek, D. J. Dudziak*
- 1195 Development of the Two-Dimensional Cross-Section Sensitivity and Uncertainty Analysis Code SENSIT-2D with Applications to the FED / *Mark J. Embrechts, D. J. Dudziak, W. T. Urban*

BLANKET AND FIRST WALL ENGINEERING

- 1203 Overview of First Wall/Blanket/Shield Technology / *Richard E. Nygren*
- 1216 A Fission-Based, Distributed, 14-MeV Fusion Neutron Radiation Source for First Wall/Blanket Component Testing and System Development / *P. Y. Hsu, L. G. Miller, G. A. Deis, Y. D. Harker, G. R. Longhurst, T. S. Bohn, E. H. Ottewitte, K. D. Watts*
- 1222 The TFTR Lithium Blanket Module Final Design and Materials Development / *D. W. Graumann, R. L. Creedon, B. A. Engholm, J. R. Lindgren, L. Yang*
- 1228 Progress in Studies of Li₁₇Pb₈₃ as Liquid Breeder for Fusion Reactor Blankets / *G. Casini*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 1233** MARS High Temperature Blanket / *J. D. Gordon, D. H. Berwald, B. A. Flanders, J. K. Garner, S. C. Mortenson, J. F. Parmer, C. A. Sink, J. C. Yu, K. L. Agarwal, S. Dharmaraj, N. M. Ghoniem, N. J. Hoffman, J. R. Bilton, B. E. Kirstein*
- 1239** Design of a High Temperature First Wall/Blanket for a D-D Compact Reversed Field Pinch Reactor (CRFPR) / *A. E. Dabiri, J. E. Glancy*
- 1245** High Performance Breeding Blankets for ICF Facilities / *A. R. Larson, I. O. Bohachevsky*
- 1251** Low Activation Fusion Reactor Design Studies / *G. R. Hopkins, E. T. Cheng, R. L. Creedon, I. Maya, K. R. Schultz, P. Trester, C. P. C. Wong*
- 1257** Lifetime Analysis of Fusion Reactor Components / *Richard F. Mattas*

ALTERNATE CONCEPTS

- 1265** Compact Fusion Reactors / *R. A. Krakowski, R. L. Hagenson*
- 1275** Recent Developments in Stellarator Physics / *John L. Johnson*
- 1284** Engineering Design of a Compact RFP Reactor (CRFPR) / *R. L. Hagenson, R. A. Krakowski*
- 1290** Experience with the Modular Design Concept of the OHTE Experimental Device During Initial Assembly, Operations, and the Mid-Experiment Upgrade / *D. W. Graumann*
- 1296** Design of the Advanced Toroidal Facility (ATF-1) / *R. L. Johnson, O. B. Adams, T. C. Jernigan, B. E. Nelson, J. F. Lyon, P. B. Thompson*
- 1302** A Design Study of a Heliotron Power Reactor / *I. Yanagisawa, N. Ueda, M. Yamada, R. Saito, T. Yamada, M. Tomita, H. Nakashima, O. Motojima, M. Nakasuga, A. Iiyoshi, K. Uo*
- 1308** Modular Stellarator Reactor Conceptual Design Study / *R. L. Miller, C. G. Bathke, R. A. Krakowski, F. H. Heck, L. Green, J. S. Karbowski, J. H. Murphy, R. B. Tupper, R. A. DeLuca, A. Moazed, R. A. Terry*
- 1314** Physical and Engineering Constraints for Tokamak Reactors with Helical Coils / *R. E. Potok, H. Becker, L. Bromberg, D. R. Cohn, N. Diatchenko, P. B. Roemer, J. E. C. Williams*
- 1320** Exploratory Reactor Physics Studies of Negative Tandem Mirror Fusion Reactors / *E. Zawaideh, F. Kantrowitz, R. W. Conn, D. Dobrott, S. Tamor, D. C. Baxter*
- 1326** EBT Reactor Characteristics Consistent with Stability and Power Balance Requirements / *N. A. Uckan, R. T. Santoro*
- 1332** Conceptual Design of Heliotron Reactor / *Shunji Kakiuchi, Yoshiaki Kazawa, Masatsugu Nishi, Takashi Okazaki, Osamu Motojima, Atsuo Iiyoshi, Koji Uo*

MAGNET ENGINEERING

- 1341** Toroidal Field Resistive Magnet Design for Tokamak Test Reactors / *R. J. Hooper, S. S. Kalsi*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 1346** A Minimum-Thickness Low-Activation Toroidal Field Coil Concept for Tokamak Reactors / *W. Chen, E. T. Cheng*
- 1352** Structural Design Considerations for the FED 50-kA Equilibrium Field Coils / *George Buchanan, Joel G. Bennett*
- 1357** A Unified Study for Determining Poloidal Field Coil Locations for a Tokamak / *V. C. Srivastava, S. S. Kalsi*
- 1363** Ripple Reduction Coils for Tokamak Reactors / *Glenn Bateman, J. R. Fox*
- 1368** Hysteresis Loss Calculations for the Tokamak Fusion Reactor Through Fields Harmonics Content / *K. Denno*
- 1373** Design and Fabrication of the Iron Core for the OHTE Experimental Machine / *B. Curwen, L. H. Franklin*
- 1378** Nondestructive Testing of Metallic Sheath for Internally Cooled Superconductor / *R. W. McClung, K. V. Cook, C. V. Dodd, J. H. Smith*
- 1384** Long-Term ETR/INTOR Magnet Testing in Support of the Demonstration Fusion Reactor / *J. Stephen Herring, Vikram N. Shah, S. Zia Rouhani*
- 1392** Proposed EBT-P Quench Detection Technique in a Magnetically Noisy Environment / *D. W. Lieurance, S. M. Cunningham, H. G. Arrendale*

PLASMA HEATING, IMPURITY CONTROL, AND FUELING

- 1401** MARS Heating Systems / *S. A. Freije, D. M. Goebel, L. J. Perkins, G. W. Hamilton, J. D. Fink*
- 1407** Engineering Design of the Quasi-Optical ECRH Injection System for the Mirror Advanced Reactor (MARS) / *L. John Perkins, Steven A. Freije, William S. Neef*
- 1413** Engineering Aspects of Lower Hybrid Microwave Injection / *J. J. Schuss, M. Porkolab, D. Griffin, S. Barilovits, M. Besen, C. Bredin, G. Chihoski, H. Israel, N. Pierce, D. Reiser, K. Rice*
- 1418** Efficient, Radiation-Hardened, 400 and 800-keV Neutral Beam Injection Systems / *O. A. Anderson, W. S. Cooper, J. A. Fink, D. A. Goldberg, L. Ruby, L. Soroka, J. Tanabe*
- 1424** Development of a Long-Pulse (30-s), High-Energy (120-keV) Ion Source for Neutral Beam Applications / *C. C. Tsai, G. C. Barber, C. W. Blue, W. K. Dagenhart, W. L. Gardner, H. H. Haselton, D. J. Hoffman, E. F. Marguerat, M. M. Menon, J. A. Moeller, N. S. Ponte, P. M. Ryan, D. E. Schechter, W. L. Stirling, J. H. Whealton, R. E. Wright*
- 1430** Experimental Database and Design Concept for a 1-MW, 200-keV Neutral Beam Line Based on a SITEX Negative Ion Source / *W. K. Dagenhart, W. L. Gardner, W. L. Stirling, J. H. Whealton*
- 1436** Microwave Transport in EBT Distribution Manifolds Using Monte Carlo Ray Tracing Techniques / *R. A. Lillie, T. L. White, T. A. Gabriel, R. G. Alsmiller, Jr.*

(Continued)

CONTENTS / SEPTEMBER 1983—VOL. 4, NO. 2, PARTS 2 and 3

(Continued)

- 1442** The Design Method for a Control Process for Multiple Source Electron Cyclotron Resonance Heating for the ELMO Bumpy Torus Proof of Principle Device / *T. L. Weaver*
- 1448** Design for the National RF Test Facility at ORNL / *W. L. Gardner, D. J. Hoffman, W. R. Becraft, C. W. Blue, S. K. Combs, W. K. Dagenhart, H. H. Haselton, P. H. Hayes, J. A. Moeller, L. W. Owen, N. S. Ponte, P. M. Ryan, D. E. Schechter, C. R. Stewart, W. L. Stirling, D. J. Taylor, J. H. Whealton*
- 1453** Analysis of Drift Ducts for TDF Neutral Beam Injectors / *J. Vetovec*
- 1459** Computational Simulation of Spheromak Plasma Heating / *R. E. Olson, G. H. Miley*

POWER CONVERSION, INSTRUMENTATION, AND CONTROL

- 1467** Thermal-Structural Analysis and Conceptual Design of the MARS Direct Converter / *T. E. Luzzi, S. Z. Fixler, V. S. Calia*
- 1473** Preliminary Analysis of a Carbon/Carbon Fiber Composite Plasma Direct Converter / *H. Gurol, G. W. Shuy, A. E. Dabiri, R. B. Dirling, Jr., D. Eitman*
- 1479** Instrumentation and Safety Controls for Tandem Mirror Fusion Reactors / *Mahmoud Z. Youssef*
- 1486** Energy Losses on Tokamak Startup / *J. G. Murray, K. E. Rothe, George Bronner*
- 1491** Coaxial Test Fixture and Pulsed Power Supply for Contact Material Screening Tests / *W. F. Praeg, D. G. McGhee, C. A. Trachsel, H. S. Zahn*
- 1497** Software Design for the Tritium Systems Test Assembly / *G. W. Claborn, R. T. Heaphy, P. S. Lewis, L. W. Mann, C. W. Nielson*
- 1503** Use of Advanced Programmable Logic Controllers to Monitor and Control the ELMO Bumpy Torus Proof of Principle Device / *Bruce A. Boyd*
- 1509** Thermal and Mechanical Design of a Double-Walled Steam Generator / *D. C. Schluderberg, J. H. Huang, L. Pong, D. K. Sze*