Fusion technology

AUTHORS — SEPTEMBER 1984

OVERVIEW

STATUS AND PLANS FOR U.S. AND INTERNATIONAL RADIO-FREQUENCY EXPERIMENTS ON FUSION DEVICES

Owen C. Eldridge, Jr.
Daniel J. Hoffman
Peter J. Kortman

Owen C. Eldridge, Jr. (top) (BS, engineering physics, University of Tennessee, 1953; PhD, physics, University of California, 1960) has been a physicist at the Fusion Energy Division, Oak Ridge National Laboratory (ORNL) since 1981. He has worked since 1972 on theory and experiment for radio-frequency (rf) plasma heating in all frequency ranges. **Daniel J. Hoffman** (center) (BSE, electrical engineering, University of Pennsylvania, 1975; PhD, electrical engineering, University of Wisconsin, 1982) is an experimental physicist working on rf plasma heating and technology in the Plasma Technology Section of the Fusion Energy Division, ORNL. **Peter J. Kortman** (bottom) (BSE, physics, Cornell University, 1965; PhD, solid state physics, Carnegie-Mellon University, 1971) is currently on the management staff of the uranium enrichment program, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee.

PLASMA ENGINEERING

COVARIANT ELECTRODYNAMICS OF CONDUCTING MEDIA

Horst E. Wilhelm

Horst E. Wilhelm (BS, 1956; MS, 1959; and PhD, 1962, engineering physics, Universities of Stuttgart and Munich) is a senior research physicist with the Naval Weapons Center, China Lake, California. From 1963 to 1965, he was a research physicist with the Allison Division of General Motors Corporation. He was assistant professor of nuclear engineering from 1965 to 1968 and professor of engineering sciences from 1978 to 1980 at the University of Florida. From 1968 to 1978, he was professor of mechanical and electrical engineering and physics at Colorado State University.

TRAIL—A TOKAMAK RAIL GUN LIMITER

Wen-Shi Yu
James R. Powell
John A. Fillo
John L Usher

James R. Powell (right) [BS, chemical engineering, 1953; ScD, chemical (nuclear) engineering, 1958], who has been at Brookhaven National Laboratory since 1956, is currently head of the Reactor Systems Office with responsibility for defining programmatic objectives, monitoring work, and contributing to the effort. He is involved in the design of both compact, high-performance nuclear reactors and advanced energy conversion systems for space power and other applications. He is a direct participant in core design, as well as mechanical, chemical, structural, and systems engineering and safety studies. He is responsible for studies of accelerator applications to nuclear energy, including breeding of fissile fuel, as well as studies of high-temperature synthetic fuel processes. Photographs and biographies for **Wen-Shi Yu, John A. Fillo,** and **John L. Usher** were not available.

BLANKET ENGINEERING

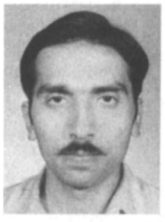
DIRECT METHOD FOR THE ESTIMATION OF MODELING PERTURBATIONS IN THE SIMULATION OF FUSION BLANKETS

Magdi Ragheb
Otto Lazareth

Magdi Ragheb [PhD, nuclear engineering and computer sciences, University of Wisconsin (UW), Madison] is an assistant professor of nuclear engineering at the University of Illinois, Urbana-Champaign. He has collaborated with the Fusion Engineering Program at UW, the Division of Engineering Physics at Oak Ridge National Laboratory, and the Departments of Applied Science and Nuclear Energy at Brookhaven National Laboratory. His theoretical interests are in the fields of computational methods, reactor theory, radiation protection and shielding, statistical simulation by the Monte Carlo method, and probabilistic risk assessment. His current technical interests are in the analysis of advanced fusion and fusion-fission energy systems. A photograph and biography for **Otto Lazareth** was not available.

(DEUTERIUM-DEUTERIUM)-DRIVEN EXPERIMENTAL HYBRID BLANKETS AND THEIR NEUTRONIC ANALYSES

Anil Kumar
Sümer Şahin



Anil Kumar (top) (BS, 1971, and MS, 1973, physics, Agra University, India; PhD, nuclear engineering, University of Bombay, 1981) is currently senior scientist at Ecole Polytechnique Federale de Lausanne, Switzerland. His main interest is in the field of fusion blanket neutronics with an emphasis on optimum utilization of ^{232}Th in fusion-fission hybrid reactors. **Sümer Şahin** (MS, mechanical engineering, 1967, and PhD, nuclear engineering, 1970, University of Stuttgart, Federal Republic of Germany; Habilitation, physics, University of Ankara, Turkey, 1973) is currently a professor at the King Saud University, Riyadh, Saudi Arabia. His research field covers fusion-fission (hybrid) reactors, thermionic space craft reactors, radiation shielding, and nonproliferation.

TRITIUM BREEDING BENCHMARK CALCULATIONS FOR A $Li_{17}Pb_{83}$ BLANKET WITH STEEL STRUCTURE

Jin Hua Huang
Mohamed E. Sawan

Jin Hua Huang (top) (graduate, mechanical engineering, Chiatong University, Shanghai, 1955) is currently a senior researcher at Southwestern Institute of Physics, Leshan, China, vice-head of the theory division. Prior to this, he worked for ten years as a reactor physics group leader at the Institute of Atomic Energy, Beijing. From 1981 to 1983 he worked in the Fusion Engineering Program (FEP) at the University of Wisconsin (UW). His current interests are neutronics and thermohydraulics of fusion reactor design studies. **Mohamed E. Sawan** (BS, nuclear engineering, University of Alexandria, Egypt, 1967; MS, 1971, and PhD, 1973, nuclear engineering, UW) is senior scientist in the FEP at UW. He worked as assistant and associate professor in the Department of Nuclear Engineering, University of Alexandria, Egypt, for seven years. His current interests are centered on neutronics and shielding analysis for magnetic confinement and inertial confinement fusion reactor designs.

MAGNET SYSTEMS

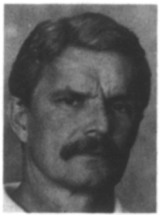
STRENGTH ANALYSIS OF THE POLOIDAL FIELD COIL FOR NUCLEAR FUSION EQUIPMENT

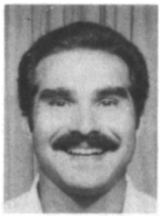
Hiroyuki Kojima
Hiroshi Miyata
Hiroshi Kimoto
Susumu Hioki
Teruhiro Takizawa
Masayuki Furuyama

Hiroyuki Kojima (top right) (BS, 1971, and MS, 1973, mechanical engineering, University of Kobe) is a researcher in the structural integrity and reliability department (SIRD) in the Mechanical Engineering Research Laboratory (MERL), Hitachi, Ltd. He has been engaged in research on the nonlinear strength analysis of structural materials for fusion reactor components. **Hiroshi Miyata** (top left) (BS, University of Iwate, 1966; MS, 1968, and PhD, 1971, mechanical engineering, University of Tohoku) is a senior researcher of the SIRD of MERL, Hitachi, Ltd. His responsibilities include conduction of the strength analysis studies of structural materials. **Hiroshi Kimoto** (center right) (BS, 1973, and MS, 1975, mechanical engineering, University of Kanazawa) is a researcher of the SIRD of MERL, Hitachi, Ltd. He has been engaged in research on materials fatigue strength using fracture mechanics for fusion reactor components. **Susumu Hioki** (center left) (BS, naval architecture, University of Osaka Prefecture, 1961; MS, 1963, and PhD, 1973, welding engineering, University of Osaka) is a manager of the Processing Technology Development Center in MERL, Hitachi, Ltd. His major research interests include applications of fracture mechanics to machines and electronics devices. **Teruhiro Takizawa** (bottom right) (BS, 1972, and MS, 1974, electrical engineering, University of Tohoku) is an engineer of the electric machine design department in the Hitachi Works of Hitachi, Ltd. He has been engaged in the design of nuclear fusion equipment. **Masayuki Furuyama** (bottom left) [BS, electrical engineering, University of Tokyo, 1963; MS, Massachusetts Institute of Technology (MIT), 1974] is a manager of the electric machine design department in the Hitachi Works of Hitachi, Ltd. He joined Hitachi, Ltd. in 1963 and was engaged in the engineering of turbine generators and nuclear fusion equipment. From 1973 to 1974, he was a fellow of the center for advanced engineering study at MIT.

POINT DESIGN FOR DEUTERIUM-DEUTERIUM COMPACT REVERSED-FIELD PINCH REACTORS

Ali E. Dabiri
Donald R. Dobrott
Husam Gurol
Dalton D. Schnack





Ali E. Dabiri (top right) (BS, engineering, Teheran Polytechnic, 1967; MS, 1969, and ScD, 1971, engineering, Massachusetts Institute of Technology) is a senior scientist at Science Applications, Inc. (SAI). He has worked on many aspects of fusion engineering issues including first-wall and blanket design of alternative fusion fuel reactors. He is currently involved in compact fusion reactor studies. Past work includes gas/solid interactions, energy conservation, and energy systems. **Donald R. Dobrott** (top left) [BS, electrical engineering, University of Washington; PhD, plasma physics, Stanford University (SU), 1964] is well known for his research in theoretical plasma physics and fusion technology that he performed at SU, the Courant Institute of Mathematical Sciences at New York University, the Princeton Plasma Physics Laboratory, GA Technologies, and SAI. He joined SAI in 1981 and currently serves as director of the Applied Plasma Physics and Technology Division. His work at SAI includes research on alternate fuels in tokamaks, reversed-field pinches (RFPs), and tandem mirrors. He currently serves as chairman of the Sherwood Plasma Theory Committee and is a fellow of the American Physical Society. **Husam Gurol** (bottom right) (BS, 1971; MS, 1972; and PhD, 1975, nuclear engineering, University of Michigan) is a senior scientist at SAI. His research areas include fusion reactor system studies, reactor safety, plasma engineering, and effects of irradiation on materials. **Dalton D. Schnack** (bottom left) (BS, engineering physics, Lehigh University, 1966; MS, physics, Trinity College, 1972; PhD, engineering/applied science, University of California, Davis, 1977) is assistant director of the Applied Plasma Physics and Technology Division at SAI. He has over 12 years experience in the theoretical, computational, and engineering aspects of the magnetic fusion program. He has worked on problems associated with tokamak, compact torus, and RFP concepts. His expertise is in large-scale numerical simulation of magnetohydrodynamic processes in these devices.

REDUCED ACTIVATION CALCULATIONS FOR THE STARFIRE FIRST WALL

Frederick M. Mann

Frederick M. Mann (BS, physics, Stanford University, 1970; PhD, physics, California Institute of Technology, 1975) is a senior scientist at the Hanford Engineering Development Laboratory. He is currently working on nuclear data evaluation and processing and computer code development for the fusion, liquid-metal, and thermal reactor programs.

INTERFACING THE TANDEM MIRROR FUSION REACTOR TO A HYDROGEN THERMOCHEMICAL PLANT

Myron A. Hoffman
D. S. Rowe

Myron A. Hoffman (top) [ScD, Massachusetts Institute of Technology (MIT), 1955] taught at MIT from 1959 to 1968. He spent two years at the Italian Ionized Gas Laboratory in Frascati (1966-1967 and 1972-1973), where he worked on magnetohydrodynamic power generation and tokamak reactor conceptual design studies. He joined the Department of Mechanical Engineering at the University of California at Davis as a professor of mechanical engineering in 1968, where his current major research interests are in heat transfer and fusion reactor technology. **D. S. Rowe** (PhD, mechanical engineering, Oregon State University, 1973) is principal of the engineering consulting firm Rowe & Associates. He has been involved with the thermal and hydraulic performance of nuclear energy systems since 1963. Since 1978 he has worked with the University of Washington and Lawrence Livermore National Laboratory on fusion blanket design and application studies.