fusion technology

AUTHORS — MAY 1990

SHIELDING

AN ANALYSIS OF RADIATION STREAMING THROUGH INHOMOGENEITIES IN THE FUSION REACTOR BLANKET AND SHIELD

Sergei A. Zimin

Sergei A. Zimin (Moscow Engineering-Physics Institute, USSR, 1982) has worked as a research associate at the Kurchatov Institute of Atomic Energy since 1982. He has studied the thermal efficiency of thermonuclear reactor toroidal field coils. Since 1988 he has been a member of the International Thermonuclear Experimental Reactor (ITER) team. His research interests are in the areas of magnet shielding, streaming, effects on subsystems, and blanket neutronics.

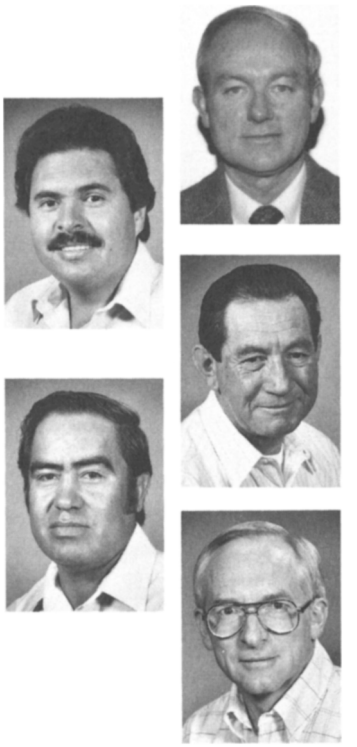
MATERIALS ENGINEERING

TESTING OF NEUTRON-IRRADIATED CERAMIC-TO-METAL SEALS

Harold N. Barr
Fred Hittman
Robert D. Brown
Frank W. Clinard, Jr.
Manuel R. Lopez
Horace Martinez
Tobias J. Romero
Jay H. Cook

Harold N. Barr (top) (BS, ceramic engineering, Alfred University) is manager of materials process development at Hittman Materials and Medical Components (HMMC), Columbia, Maryland. He has been involved with brazing ceramics, ceramic-to-metal seals, and graphite for medical and fusion energy applications. **Fred Hittman** (bottom) (BSc, chemical and metallurgical engineering, University of Michigan, 1951) founded HMMC. He has been involved in the design of nuclear power devices and the solution of materials problems in the nuclear and medical fields. His most recent interests are related to high-reliability hermetic seals. **Robert D. Brown** (photograph not available) (BS, engineering science, State University of New York at Buffalo, 1968; PhD, materials science and engineering, Cornell University, 1974) has been a staff member at Los Alamos National Laboratory (LANL) since 1976. He works in the experimental areas group (MP-7) at the Los Alamos Meson Physics Facility (LAMPF) and

is involved in research on radiation damage to materials. **Frank W. Clinard, Jr.** (top right) (BS, mechanical engineering, and MS, metallurgical engineering, North Carolina State University; PhD, materials science, Stanford University, 1965) has been with LANL since 1964. Since 1972, he has been involved in studies of materials for fusion reactor applications and is presently leader of the Radiation Effects Section at LANL. **Manuel R. Lopez** (top left) has been with LANL since 1970 as a member of the hot cell examination group. For the past 15 years, he has played a major role in remote metallography and microstructural analysis of reactor fuels. **Horace Martinez** (center right) has been involved with nuclear reactor research since 1962 and has been with LANL since 1968. He performs remote examination and testing of irradiated research experiments in the Hot Cell Facility. **Tobias J. Romero** (bottom left) has been with LANL since 1968. He has been involved in the postirradiation studies of Rover fuel, Experimental Breeder Reactor II fuel, and irradiated materials from LAMPF. **Jay H. Cook** (bottom right) (BS, industrial technology, Utah State University; PhD, metallurgy, University of Utah) has been with LANL since 1977, working with irradiated materials examinations.



PLASMA ENGINEERING

LINEAR OPTIMAL CONTROL OF TOKAMAK FUSION DEVICES

Charles E. Kessel
Marc A. Firestone
Robert W. Conn

Charles E. Kessel (top) [BS, physics and nuclear engineering, University of California, Santa Barbara, 1982; MS, 1984, and PhD, 1987, fusion engineering and applied plasma physics, University of California, Los Angeles (UCLA)] is a nuclear analyst/plasma engineer at Princeton Plasma Physics Laboratory (PPPL), Princeton University. His primary areas of interest include plasma equilibrium and dynamic simulation, equilibrium reconstruction from measurements, and classical and optimal control of tokamak plasmas. **Marc A. Firestone** (center) (PhD, physics, The University of Michigan, 1974) is currently at Mission Research Corporation. From 1982 to 1986 he was a research staff member in the Fusion Engineering and Physics Program at UCLA where he was involved with physics steam studies of tandem mirrors and tokamak reactors. From 1978 to 1982 he was at PPPL where he worked on various physics issues impacting Tokamak Fusion Test Reactor and International Tokamak Reactor design concepts. He was a National Aeronautics and Space Administration contractor from 1974 to 1978. In addition to the physics of fusion reactors, his research has included experimental nuclear physics, satellite orbital dynamics and control, and the application of modern optimal control theory to tokamak plasmas. **Robert W. Conn** (bottom) (PhD, California Institute of Technology, 1968) spent a year at the Joint Euratom Nuclear Research Center at Ispra, Italy, and a year at the Brookhaven National Laboratory before joining the University of Wisconsin (UW) in 1970. While at UW, he served as professor of nuclear engineering and as director of the Fusion Engineering Program.

Since 1980 he has been a member of the UCLA faculty as a professor of engineering and applied science. His primary research interests include fusion reactor physics and technology, plasma physics, neutron transport and nuclear reactor physics, reactor plasma analysis, and surface physics.

A SIMPLE ONE-DIMENSIONAL PERSONAL COMPUTER-BASED PLASMA-EDGE ENGINEERING MODEL FOR DIVERTOR DESIGN CALCULATIONS

Michael D. Baehre
Don Steiner

Michael D. Baehre (top) [MS, nuclear engineering, Rensselaer Polytechnic Institute (RPI), 1988] is an associate professor in the Department of Physics at the U.S. Military Academy at West Point. His research interests include divertor operation, plasma/wall interactions, and nonlinear dynamics. **Don Steiner** (BS, chemical engineering, 1960; MS, 1962, and PhD, 1967, nuclear engineering, Massachusetts Institute of Technology) is a professor of nuclear engineering at RPI. Since 1968, he has been involved in fusion power systems analysis and design. His current interests include plasma engineering, blanket development, and reactor design.

ICF TARGETS

BUBBLE PREFORMS FOR PRODUCING GLASS MACROSHELLS FOR INERTIAL CONFINEMENT FUSION TARGETS

Simon C. P. Wang
Delbert E. Day

Simon C. P. Wang (top) (BE, mechanical engineering, Chung Yuan Christian University, Taiwan, 1971; MS, materials science and engineering, Iowa State University, 1978; PhD, ceramic engineering, University of Missouri-Rolla, 1987) is a postdoctoral research associate at the Innovative Nuclear Space Power Institute at the University of Florida. His research interests are mainly in nuclear materials, including metals and ceramics for both fission and fusion reactor applications. **Delbert E. Day** (BS, ceramic engineering, University of Missouri-Rolla; MS and PhD, ceramic technology, Pennsylvania State University) is Curators' Professor of Ceramic Engineering and director of the Graduate Center for Materials Research at the University of Missouri-Rolla. He is currently investigating the containerless processing of glass in microgravity and has conducted two experiments on the space shuttle as part of the National Aeronautics and Space Administration's Material Processing in Space Program.

ENERGY CONVERSION

ASSESSMENT OF THE POTENTIAL OF MAGNETOHYDRODYNAMIC ENERGY CONVERSION FOR TOKAMAK REACTORS

P. Massee
L. H. Th. Rietjens
A. J. D. Lambert

P. Massee (right) (MSc, aeronautical engineering, Delft University of Technology, The Netherlands, 1965; PhD, technical sciences, Eindhoven University of Technology, The Netherlands, 1983) is a senior lecturer in the Department of Electrical Engineering, Division of Electrical Energy Systems, at the Eindhoven

University of Technology. His field of research is magnetohydrodynamic (MHD) power generation. **L. H. Th. Rietjens** (top) (MS, 1955, and PhD, 1956, physics and mathematics, University of Utrecht, The Netherlands) is a professor of electrical engineering at the Eindhoven University of Technology. His interests are in energy, thermonuclear research, and MHD electrical power generation. **A. J. D. Lambert** (bottom) (MSc, 1975, and PhD, 1979, technical physics, Eindhoven University of Technology, The Netherlands) is a lecturer in industrial engineering at Eindhoven University of Technology, in the field of systems approaches to production systems, focusing on energy and environmental effects.

BLANKET ENGINEERING

LOTUS LITHIUM-LEAD FUSION BLANKET CONCEPT FOR NEUTRONICS EXPERIMENTS

Saber Azam
Anil Kumar

Saber Azam (top) [BSc, mechanical engineering, Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, 1982] is currently completing work on his doctoral thesis research on development of a flexible lithium-lead blanket module for fusion neutronics experiments at the LOTUS facility of EPFL. Previously, he worked variously, for a year, on energy economy in thermal installations (with a private company) and medical engineering (University of Lausanne). **Anil Kumar** [MS, physics, Agra University, India; PhD, physics (nuclear engineering), University of Bombay, India, 1981] is currently development engineer at the University of California, Los Angeles. His current research activities are in the area of fusion reactor nucleonics experiments and analysis and in technique development for prompt and decay nuclear heat measurements. He conducted a number of nuclear heat experiments during 1988 and 1989 at the Fusion Neutronics Source Facility of the Japan Atomic Energy Research Institute. He worked as a senior scientist in the experimental fusion neutronics program at the LOTUS facility of EPFL and was a scientific officer at the Bhabha Atomic Research Center, India. His other research contributions have been related to inertial confinement fusion physics, suprathermal fusion, method development in transport theory, muon-catalyzed fusion, and fission reactor physics.

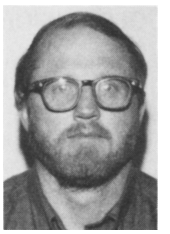
SHIELDING

SHIELDING STUDIES FOR THE CONFINEMENT PHYSICS RESEARCH FACILITY

William P. Kelleher
J. Wiley Davidson
Gary R. Thayer
Donald J. Dudziak

William P. Kelleher (top) (BS, 1982, and PhD, 1987, nuclear engineering, Rensselaer Polytechnic Institute) is a staff member in the Analysis and Assessment Division at Los Alamos National Laboratory (LANL). His current research activities include radiation transport and both magnetic and inertial confinement fusion reactor designs. **J. Wiley Davidson** (bottom) (BS, 1969; MS, 1975; and PhD, 1979, University of Texas at Austin) is presently group leader of the Strategic Systems Engineering Group

at LANL. His responsibilities include systems analyses and engineering for the neutral particle beam, the ground- and space-based free electron laser, nuclear-directed energy weapons, and other Strategic Defense Initiative projects; studies of offensive strategic nuclear weapons effects and effectiveness; and analyses of integral fusion neutronics experiments. He was most recently deputy group leader of the energy systems analysis group, where his responsibilities included fusion nucleonics code development and analyses as well as nuclear containment technology development. His research has focused on transport theory and nucleonics methods development, fusion blanket design and analyses, nuclear cross-section experimental analyses, and radiation detector response characterization. **Gary R. Thayer** (top) (BS, physics, University of Nebraska, 1966; PhD, nuclear engineering, University of Illinois, 1973) is a staff member in the Analysis and Assessment Division at LANL. His current research activities include radiation transport and energy engineering studies for Central America. **Donald J. Dudziak** (bottom) (BS, marine engineering; MS, radiological physics/radiation biology; PhD, applied mathematics) is an LANL fellow. He has recently pursued interests in accelerator production of tritium and modernization issues for portions of the U.S. Department of Energy complex. As section leader for high technology systems studies at LANL, he continues his interests in fusion systems and code development, including cooperative research with the Paul Scherrer Institute in Switzerland. Since joining LANL in 1965, he has worked on a variety of projects, including experimental fission reactors, nuclear cross-section data systems, transport theory and reactor physics methods and codes, and fusion nucleonics. He previously was a senior engineer at the Bettis Laboratory and an instructor in the Bettis Reactor Engineering School. He is interested in radiation shielding methods and analysis.



ICF TARGETS

NEUTRONIC EFFECTS IN INERTIAL CONFINEMENT FUSION TARGETS

José M. Martínez-Val

José M. Martínez-Val [PhD, nuclear engineering, Madrid Polytechnic University (UPM), Spain, 1977] is a professor of nuclear technology and vice director of the Institute of Nuclear Fusion at UPM. He has been president of the Spanish Nuclear Society and a member of the European Nuclear Society Steering Committee. His current interests are neutronics (both in fission and fusion applications) and inertial confinement fusion.

COLD FUSION

COULOMB-ASSISTED COLD FUSION IN SOLIDS

Michael Danos

No photograph and biography for **Michael Danos** were available at publication time.

COLD FUSION OBSERVED WITH ORDINARY WATER

Takaaki Matsumoto

Takaaki Matsumoto (MS, nuclear engineering, Kyoto University, Japan, 1966) studied neutron and nuclear reactor physics at the Kyoto University Research Reactor Institute from 1966 to 1973. Since 1973 he has been with Hokkaido University as an associate professor of nuclear engineering. His interests include nuclear transmutation of radioactive wastes and nuclear industry.

COLD FUSION IN A CONFINING PHASE OF QUANTUM ELECTRODYNAMICS

Magnus Jändel

Magnus Jändel (PhD, theoretical physics, Royal Institute of Technology, Sweden, 1985) was a fellow at the European Organization for Nuclear Research from 1986 to 1988. He currently works at the Manne Siegbahn Institute of Physics in Stockholm. His major activity is theoretical research in muon-catalyzed fusion. His interests include high-energy physics and astrophysics.

ON FUSION/FISSION CHAIN REACTIONS IN THE FLEISCHMANN-PONS "COLD FUSION" EXPERIMENT

Samim Anghaie
Piotr Froelich
Hendrik J. Monkhorst

Samim Anghaie (top) (PhD, nuclear engineering, Pennsylvania State University) is an associate professor of nuclear engineering sciences and associate director of the Innovative Nuclear Space Power Institute, University of Florida. Before joining the University of Florida, he served on the faculty of the Oregon State University, Department of Nuclear Engineering. His research interests include neutral- and charged-particle transport and molecular gas-dynamic modeling of a partially ionized fissioning plasma. **Piotr Froelich** (photograph not available) (PhD, physics, Uppsala University, Sweden, 1978) is a professor of quantum chemistry at Uppsala University. He participated in the Quantum Theory Project at the University of Florida as a visiting research fellow during spring and fall 1989. He is recognized for his research of metastable state in atomic and molecular systems. His research interests include study of collision phenomena and transport modeling of muon-catalyzed fusion. **Hendrik J. Monkhorst** (bottom) (PhD, University of Gröningen, The Netherlands, 1968) was on the faculty of the University of Utah, Department of Physics from 1968 until 1978. From 1978 until the present, he has been at the University of Florida, and he now is a professor of physics and chemistry. His research interests have been in neutrino mass determination, theory of muon-catalyzed fusion, and polymer superconductivity as well as topics in computational quantum chemistry.

CROSS SECTION FOR COLD DEUTERIUM-DEUTERIUM FUSION

Yeong E. Kim

Yeong E. Kim (BS, chemistry and mathematics, Lincoln Memorial University, 1959; PhD, physics, University of California, Berkeley, 1963) was employed at Bell Laboratories from 1963 to 1965. From 1965 to 1967, he was a postdoctoral fellow at Oak Ridge National Laboratory. Since 1967, he has been professor of physics at Purdue University. He was a member of the National Science Foundation review panel for the Stanford Physics Accelerator and has been a consultant for Los Alamos National Laboratory since 1974. His interests are in theoretical nuclear physics, gravitational theory, theoretical geophysics, and nuclear fusion.