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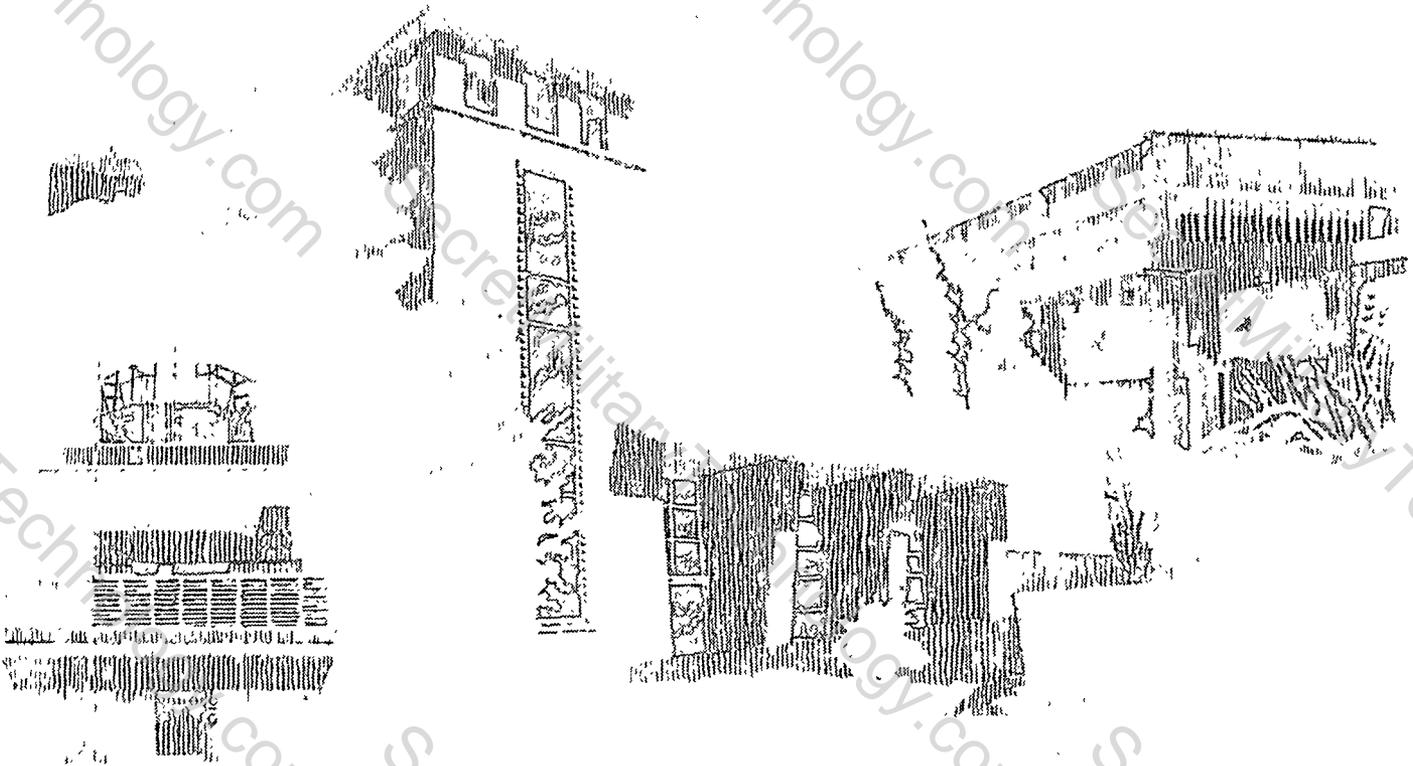
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Index of Light Ion Inertial Confinement Fusion Publications and Presentations January 1989 through December 1993

Mary Ann Sweeney

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico 87185 and Livermore, California 94550
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Index of Light Ion Inertial Confinement Fusion Publications and Presentations January 1989 through December 1993

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Abstract

This report lists publications and presentations that are related to inertial confinement fusion and were authored or coauthored by Sandians in the Pulsed Power Sciences Center from 1989 through 1993. The 661 publications and presentations are categorized into the following general topics: (1) reviews, (2) ion sources, (3) ion diodes, (4) plasma opening switches, (5) ion beam transport, (6) targets and deposition physics, (7) advanced driver and pulsed power technology development, (8) diagnostics, and (9) code development. Research in these areas is arranged by topic in chronological order, with the early efforts under each topic presented first. The work is also categorized alphabetically by first author. A list of acronyms, abbreviations, and definitions of use in understanding light ion inertial confinement fusion research is also included.

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Introduction

Fusion is a potential source of electrical energy and process heat for industry that is characterized by the availability of a tremendous amount of natural raw fuel and the potential for reduced environmental impact. In recent years, the United States has had fusion research programs in two distinct areas: low-intensity, long-duration magnetic confinement fusion energy (MFE) and high-intensity, short-duration inertial confinement fusion (ICF). The goal of MFE research is to develop the technology to demonstrate the application of magnetic fusion to commercial energy production. The objective of the National ICF Program is to provide an intense burst of thermonuclear reaction products (x-rays, gamma rays, neutrons, and hot plasma) to drive high yield physics experiments related to nuclear weapons physics, basic science, and energy production. Current funding of fusion research is focused on devices that will allow demonstration of scientific, as opposed to engineering, feasibility: the tokamak for MFE and the glass laser for ICF, with lesser support for alternative magnetic devices and alternative inertial drivers. Over the past twenty years, Sandia National Laboratories has undertaken a different approach to fusion by inertial confinement. Instead of laser beams we rely on capacitor-based, short-pulse energy storage devices to convert electrical energy into light ions that implode tiny pellets containing deuterium and tritium. This approach to the fuel-pellet implosion process is potentially efficient, simple, and cost effective, but, like all other approaches to fusion, it requires the solutions to a series of formidable technical problems. This document provides a record, in the form of a listing of publications and presentations, of the progress made from 1989 to 1993 in solving these problems.

The charged-particle-beam approach to inertial confinement fusion was made possible by the growth of pulsed power technology, which began in the mid 1960s. This technology was supported by the Atomic Energy Commission (now the Department of Energy) and the Defense Nuclear Agency to provide radiation sources to test the survivability of intercontinental ballistic missiles against bursts of radiation from anti-ballistic-missile warheads. For more than twenty-five years, aboveground pulsed-power simulators have supplemented underground testing of the survivability and hardening of nuclear weapons. The Sandia National Laboratories fusion effort formally began in 1973 as a direct spin-off of this simulation technology that bathed a weapon component in bremsstrahlung radiation. Facilities such as the Particle Beam Fusion Accelerator II (PBFA II) have the potential to be on the critical path to a proposed high-yield laboratory facility for aboveground experiments (AGEX) of nuclear weapons physics, and an affordable facility may not be possible without pulsed power technology.

This report lists publications and presentations, with Sandians as authors or coauthors, relating to ICF from 1989 through 1993. The publications and presentations are categorized under the following topics: (1) reviews, (2) ion sources, (3) ion diodes, (4) plasma opening switches, (5) ion beam transport, (6) targets and deposition physics, (7) advanced driver and pulsed power technology development, (8) diagnostics, and (9) code development. The research is arranged in chronological order, with the early efforts under each topic presented first. In some cases, a publication or presentation is listed under more than one topic area. The work is also categorized alphabetically by first author. Where a

presentation was followed by a conference publication or proceedings, both the presentation and the publication are included. A publication consisting of an abstract only is not included. In addition, where known, invited talks and papers are so designated.

The report also includes a list of acronyms, abbreviations, and definitions useful in reading papers on light ion ICF research. In addition, we have provided a chronological list of the 95 plasma-related meetings at which presentations were given.

The light ion approach emphasizes teaming with universities, industry, and other Department of Energy (DOE) laboratories to understand and resolve key physics issues by using the best facilities, computational techniques, and x-ray sources. A number of the presentations and publications listed include non-Sandian authors. Some of the institutions represented include Los Alamos National Laboratory, Cornell University, Krall Associates, University of Wisconsin, Ktech Corporation, Naval Research Laboratory, Phillips Laboratory, Physics International, Maxwell Laboratories, University of New Mexico, Mission Research Corporation, NumerEx, Vanderbilt University, Science Engineering Associates, EG&G, Weizmann Institute of Science in Israel, and Karlsruhe Nuclear Fusion Center in Germany.

The editor would appreciate being made aware of presentations and publications related to inertial confinement fusion that have been inadvertently omitted. For those with access to the HP LAN in Organization 9500 at Sandia National Laboratories, the list is available in the following FrameMaker file: /users/masween/publish/89to93icfpubs.doc.

The work indexed in this report was formerly supported by the U. S. Department of Energy under Contract No. DE-AC04-76-D000789. Since 1 October 1993 this work has been supported under Contract No. DE-AC04-94-AL85000.

About Sandia National Laboratories

Sandia National Laboratories is a multiprogram engineering and science laboratory operated for the Department of Energy since 1949, first by the American Telephone and Telegraph Company and, beginning 1 October 1993, by Martin Marietta Corporation (now Lockheed Martin). Sandia National Laboratories has major facilities in Albuquerque, New Mexico, and in Livermore, California, as well as a test range near Tonopah, Nevada, and within the Navy Pacific Missile Range in Kauai, Hawaii. The light ion inertial confinement fusion effort is concentrated at the New Mexico site. The Laboratories' principal mission since 1949 has been systems engineering for the nonnuclear components of nuclear weapons systems. In the early 1970s Sandia, recognizing a match of its technical capabilities to the national energy problem, began to apply its expertise and experience to develop new energy sources and to achieve improvements in present energy sources. Sandia is now responsible for major programs in fossil, solar, inertial confinement fusion, and fission energy. On a smaller scale, Sandia conducts energy research in geothermal, magnetic fusion, wind turbines, environmental, conservation, combustion, and basic energy sciences. In the last five years, funding for environmental research, arms control, and civilian spin-off technologies has increased and a significant number of cooperative research and development agreements (CRADAs) have been signed with private industry. Some work at the laboratories is undertaken for other federal agencies, such as the Department of Defense, the National Aeronautics and Space Administration, the National Cancer Institute, the Nuclear Regulatory Commission, the Department of State, the U. S. Geological Survey, and the Environmental Protection Agency. The nine core competencies at Sandia are engineering processes and materials, computational and information sciences, microelectronics, engineering sciences, surety technologies, advanced manufacturing, pulsed power, engineered systems, and experimental, computational, and analytic evaluation.

Acronyms, Abbreviations, and Definitions

1-D	One-dimensional geometry or simulation code
2-D	Two-dimensional geometry or simulation code
2 1/2-D	A simulation code using two dimensions in coordinate space and three dimensions in velocity space to calculate particle positions
3-D	Three-dimensional geometry or simulation code
achromatic solenoidal focusing	Baseline ballistic ion beam transport scheme for LMF that employs a solenoidal lens focusing system
ACS	Access Control System: automated system to restrict personnel and visitor access during PBFA-II experiments
active ion source	Source that does not require the accelerator to deliver power to the diode in order to generate ions
AGEX	Aboveground Experiments: laboratory experiments to simulate nuclear weapons effects and weapons physics
A-K gap	Physical gap between the cathode tip and the opposing anode surface; also, gap between the virtual cathode formed by an electron sheath emanating from the cathode tip and the anode surface (This reduced gap is also known as the effective gap.)
albedo	Refers to the fraction of x-rays absorbed in a material that are subsequently re-emitted
ALE	Arbitrary Lagrangian-Eulerian
ALIAS	Advanced Light Ion Accelerator System: system consisting of 10-ohm, 1-MV water Blumlein connected to a pulse power splitter to form a two-stage extraction ion diode
A module	In LMF and ETF designs, one of about 20 low-voltage modules for delivering power to an extraction ion diode
anode	Positive ion emitting electrode of a diode
applied-B diode	Diode with an applied (i.e., external) magnetic field
ATHETA	Sandia code to solve magnetostatics problems in two dimensions using cylindrical coordinates; used to design magnetic field coils and anode and gas cell shapes in pulsed power diodes
Auger process	Two-electron process in which an electron in a less tightly bound state fills an electronic vacancy with the simultaneous emission of a second electron from the atom
AVS	Application Visualization System: Stardent software that allows 3-D objects to be viewed, animated, and manipulated on a computer terminal screen

barrel diode	Ion diode configuration in which an axisymmetric ion source is focused radially inward towards the center of a cylindrically-symmetric device (A barrel diode is the same as a radial diode.)
Bdot probe	dB/dt loop probe used to measure ion current in pulsed power experiments
biconic	Two conical conductors having a common axis and vertex
Blackjack 5	Maxwell Laboratories accelerator used in 1989 and 1990 to test PBFA-II plasma opening switch geometries
blade load	Thin electron emitting metal to which electrical power is delivered
B module	In LMF and ETF designs, one of about 12 high-voltage modules that would deliver power to an extraction ion diode; the power pulse is roughly a factor of ten higher than that delivered by an A module
BOLVAPS	Boil Off Lithium Vapor Source: active source that produces lithium vapor by rapid ohmic heating of a thin film laminate containing lithium
breakeven	Point at which the energy generated in a fusion reaction equals the energy necessary to maintain the reaction
bremstrahlung	Hard x-ray radiation produced by the slowing down of a free electron by interaction with an ion; German word for braking radiation
brightness temperature	Temperature of a blackbody radiator that has the same brightness as a given source; in the case of a hohlraum filled with low-density foam, brightness temperature is a more accurate measure of temperature than radiation temperature
BUILDPPF	Post-processor routine that allows new PFF files to be constructed from one or more existing PFF files
capacitor	Pulsed power device consisting of conducting plates of opposite charge on either side of a dielectric surface, used for storage of electrical energy in a charged system
cathode	Electron emitting electrode of a diode
CCD	Charge-coupled detector: a device that arranges a relatively large number of discrete detectors in an array and that requires only one output channel
channel transport	Transport scheme using magnetic field of z-discharge current to confine the ion beam; also known as wall-confined channel transport
charge exchange effect	Process whereby a beam ion in the A-K gap exchanges its charge with a background neutral
charge neutralization	Condition such that the net space charge is zero; in situations for which small charge clumps exist in an ion beam, the residual charge can contribute to beam microdivergence
Child-Langmuir current density	See J_{CL}

circuit code	Computer code for analyzing the elements of the circuit in a pulsed power device to determine an unknown voltage or current
C/M System	Control/Monitor System: central computer console within the screen room that controls PBFA II and its support systems
coax	Transmission line cable used to transmit data signals and consisting of a tube of electrically conducting material surrounding a central conductor and covered by insulator material
COBRA	Cornell Beam Radiation Accelerator: 5-MV, 200-kA accelerator being constructed at Cornell University to support joint research on extraction ion diodes and non-protonic ion beams
conduction time	Interval of POS operation during which electrons from the generator take a path from the cathode, across a plasma filling the A-K gap, and run back along the anode to the generator; the switch conduction time ends when a gap opens between the cathode and the fill plasma, breaking the current path
CONRAD	One-dimensional University of Wisconsin hydrodynamics code that includes the effects of vaporization and condensation of wall materials and deposition of x-rays and ions in the reactor chamber gas and walls
Contamination Area	Area where access is restricted to limit exposure to removable radioactive contamination of surfaces
contrast ratio	Ratio between peak of the ion power in the "B" module beams of LMF vs peak of the ion power in the "A" module beams; also, ratio between peak and foot of a power pulse; the contrast ratio for a high yield target depends upon the fuel equation of state
Controlled Area	Area where access is restricted to limit exposure to radioactive hardware
convergence ratio	Ratio between uncompressed and compressed fuel radius
CRADA	Cooperative Research And Development Agreement between a national laboratory and private industry, authorized by the Department of Energy
CR-39 film	Nuclear-track-recording diagnostic that uses filters to range out different portions of the ion beam in determining the energy distribution
cryogenic cathode	Technique to delay formation of cathode plasma by cooling the cathode to about -200 °C
CS&T	Core Science and Technology program of National Ignition Facility
CT	Current Toggled plasma opening switch: switch that uses a rapidly rising external magnetic field at the cathode to open the gap further
current enhancement	Ratio of ion current density to Child-Langmuir current density, J_i/J_{CL}

current neutralization	Condition in which current amplitude is equally divided between negative charge (usually electrons) and positively charged ions
DAS	Data Acquisition System: system in PBFA II that receives and records diagnostic signals; includes over 200 waveform recorders, hardware and software to control the recorders and analyze data, and more than 25 miles of cable linking diagnostic monitors to the recorders
DATHETA	Diffusive ATHETA: SNL code that calculates the time-dependent magnetic field driven by specified coil configurations in a two-dimensional region containing free space and diffusive media
DD	Deuterium-Deuterium fuel or neutrons
dE/dx measurement	Measurement of the energy deposition range of a particle in a material
diocotron mode instability	High-frequency electromagnetic instability phase not contributing to growth of ion divergence; the frequency of the instability is significantly shorter than the ion transit time across the A-K gap
diode	Two-electrode device with positively-charged terminal (anode) and negatively-charged terminal (cathode)
direct drive	ICF target concept in which laser or particle beams directly drive the target to ignition
divergence	Spreading (increase in spot size) of an ion beam caused by scattering, instabilities, etc.
DOE	Department of Energy
DP	Defense Programs
DT	Deuterium-Tritium fuel or neutrons
DYNAID	Implicit, multi-species, collisional fluid code that can handle large applied electric and magnetic fields; being developed at SNL to model charge-exchange neutrals, ionization, and other particle interactions in an ion diode
effective gap	Gap between virtual cathode and the anode, where the virtual cathode is defined by the location of electrons above the cathode surface
EHD	Electrohydrodynamic: active ion source that relies on intense electric fields to release ions from a surface
electron launcher	Voltage probe that uses launched electrons to diagnose electron flow in a magnetically insulated transmission line; sometimes referred to as an ELVM probe (electron launcher voltage monitor)
electron limiter	Non-emitting protrusion on the anode of an ion diode that has been used to control impedance collapse by the collection of electrons; in an extraction diode, can be used to reduce the divergence

electron stimulated desorption	Various phenomena associated with the desorption of neutral and ionic species from surfaces bombarded by electrons
EM	Electromagnetic: simulation technique that models the electric and magnetic fields in a pulsed power device
EMFAPS	Evaporating Metal Foil Anode Plasma Source: active ion source developed at Cornell University and the Nuclear Research Center in Karlsruhe, Germany
EOS	Equation Of State: equation describing the state (pressure, temperature, degree of ionization) of a material
ETF	Engineering Test Facility: proposed fusion facility for energy applications with low yield and a moderate repetition rate that might employ a heavy ion driver
exploding pusher target	Target in which the shell is thin enough that beam energy is deposited nearly uniformly throughout; such a target explodes rather than imploding and the fuel ρr remains low
extraction diode	Diode configuration in which an ion source is transported longitudinally down the axis of a cylindrically-symmetric device
Faraday cup	Ion current diagnostic to measure ion beam uniformity and divergence
FFT	Fast Fourier transform
fiber array diagnostic	Time-resolved, streak-camera-based diagnostic to provide temporally continuous one-dimensional images of an ion beam target
filamentation instability	Plasma instability that can cause a beam to break into a large number of tiny filaments or magnetic pinches
first wall	Structural wall of a reactor chamber that contains the pressure generated by the fusion pulse; first wall can be a dry wall, a wetted surface, or protected by a movable, replenished surface
FLASH	Post-processor for QUICKSILVER that produces 3-D graphics
flashboard	Surface composed of a solid dielectric covered partially by a thin plating of metal; plasma is created by an electrical discharge over the surface
flashover source	A plasma source created by a discharge (electric arc) occurring over the surface of a solid dielectric in a gaseous or liquid medium
FODS	Fiber optic distribution system
fuel capsule	Capsule within a hohlraum that contains cryogenic or gaseous DT fuel, often enclosed by a metallic shell
fuel ρr	Integrated value of fuel density and radius; quantity important in assessing the range of an ion (in particular, an alpha particle) in the fuel
FWHM	Full width at half maximum

Gamble II	Terawatt-level pulsed power accelerator at Naval Research Laboratory operating in negative or positive polarity
gas cell	Thin membrane, usually 1-2 μm of mylar, that separates the vacuum acceleration region in an ion diode from a gas region of a few Torr; within the gas, space charge and current neutralization is nearly complete
gas switch breakdown	Abrupt rise in electrical current that causes a gas switch to trigger
GSI	Gesellschaft fur Schwerionenforschung in Darmstadt, Germany
H/C	Halite/Centurion: underground tests of inertial confinement fusion feasibility
HELIA	Four-stage linear inductive adder machine using an extraction ion diode geometry and operating in positive polarity; originally designed as proof-of-principle experiment for the Hermes III accelerator
Hermes III	Linear inductive-voltage-adder accelerator, with demonstrated positive-polarity capability, that is similar in design and concept to the smaller SABRE and the larger proposed LMF modules. Hermes III should accurately replicate the full two-stage driver of an LMF "A" (low voltage) module as well as the injector stage of an LMF "B" (high voltage) module.
HIBALL	Heavy Ion Beams and Lithium Lead: reactor concept developed by University of Wisconsin that uses lithium-lead waterfall to protect the reactor chamber walls
HIF	Heavy Ion Fusion: ICF concept using heavy ions to drive a fusion target
high yield target	ICF target with yield of 200 to 1000 MJ; such a target requires a high degree of radiation uniformity incident on the fuel capsule
hohlraum	Foam-filled region around an indirectly-driven light-ion target; ion deposition in this region produces soft x-rays that then drive the target; in the case of a laser hohlraum, vacuum surrounds the indirect-drive target, and holes are present in the cylindrical endcaps to allow entrance of laser beams
hybrid code	Electromagnetic simulation code using a mixed fluid and particle description for the plasma
IBEST	Ion Beam Enhanced Surface Treatment: a new technology, derived from pulsed power, to obtain improved surface finishes using intense, repetitively pulsed ion beams and based upon ion source research
IC	Induction cavity
ICF	Inertial Confinement Fusion: concept in which fuel is confined inertially within a tiny capsule until thermonuclear reactions spread throughout the fuel

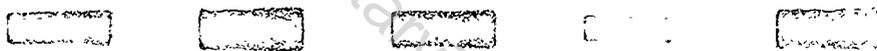
ICFAC	Inertial Confinement Fusion Advisory Committee: committee tasked by the Department of Energy to complete periodic reviews of the national ICF programs
IDL	Code to analyze voltage and current waveforms from pulsed power experiments; earlier Sandia version was called IDR
IFE	Inertial Fusion Energy
ignition target	ICF target in which the energy produced exceeds the energy lost through bremsstrahlung but is not sufficient to equal the energy used to generate the fusion process
ILE	Institute for Laser Engineering at Osaka University in Osaka, Japan: location of Reiden IV and Reiden SHVS ion beam accelerators
impedance collapse	Situation in which the diode voltage and the ion current are out of phase such that the diode voltage is decreasing as the ion current is increasing
imploding pusher target	Target in which particle beam energy is deposited primarily in the outermost layers (the ablator); the pusher layer internal to the ablative layer then implodes, driving the fuel to high temperatures and high ρr .
indirect drive	ICF target concept in which laser or particle energy is converted into soft x-rays that then drive the fuel capsule
inductive voltage addition	Pulsed power technology in which low voltage pulses are generated in individual accelerating modules, fed into induction cavities that replace the wave addition in water, and then through low inductance, liquid/vacuum interfaces; pulses are then added in series using a self-magnetically-insulated transmission line
ion impact ionization	Ionization of a particle by the impact of an ion, resulting in electron ejection from the atom
IONMIX	University of Wisconsin code for computing EOS and radiative properties of plasmas
ion mode instability	Low frequency electromagnetic instability in the A-K gap responsible for increasing the ion beam divergence; the frequency of the instability is related to the ion transit time across the gap
ion movie camera	Diagnostic that produces individual snapshots of the ion beam focus at short time intervals (typically, 2 ns)
ion pinhole camera	Camera that uses CR39 film to record ions backscattered from a thick gold foil; different thickness filters provide energy discrimination for the images of different ion species
ion range filter	Diagnostic technique that uses the ion energy range in material layers to discriminate ion species and energy
IPROP	Three-dimensional, electromagnetic hybrid (mixed fluid and particle) code with a tensor conductivity, developed by Mission Research Corporation to simulate ion and electron transport and gas breakdown; fast electrons are treated as particles and followed explicitly

IPS	Internal Pulse Shaping: concept whereby the target drive history is adjusted through changes internal to the radiation case
ITF	Integrated Test Facility: facility to test hardware before installation on PBFA II
ITS	Integrated Tiger Series: codes for computing Monte Carlo transport of electrons and photons in multi-layer material; so named because the original 1-D code, TIGER, had stripes (layers) of different materials
IVORY	Pure particle-in-cell version of the three-dimensional electromagnetic code IPROP
J _{CL}	Child-Langmuir current density that scales as $\frac{4}{9} \left(\frac{2q}{m} \right)^{1/2} \epsilon_0 \frac{V^{3/2}}{d^2}$, where d is the initial (full) A-K gap
Jupiter	Powerful x-ray source being designed for aboveground experiments in effects testing, with weapons physics as a secondary mission
KALIF	Light ion accelerator at KfK in Karlsruhe, Germany; used for studies with applied-B and self-magnetically-insulated extraction ion diodes
K-Alpha x-rays	Ion-induced x-rays used to characterize the ion beam
KD0	Key Decision Zero: project classification in the DOE Project Management System that authorizes start of conceptual design
KD1	Key Decision One: project classification in the DOE Project Management System that authorizes start of formal construction
KfK	Kernforschungszenstrum, Karlsruhe, Germany: researchers here were the first to demonstrate experimentally the role of electron limiters and high magnetic insulation levels in reducing ion beam divergence
KrF laser	Krypton fluoride laser: a computer-controlled laser on PBFA II to synchronize pulses in the 36 pulse forming lines; also, a desktop-scale laser to study soft x-ray projection lithography concepts
LANL	Los Alamos National Laboratory
laser triggered switching	Method to synchronize voltage pulses in the 36 pulse forming lines on PBFA II; sometimes referred to as LTS
LASNEX	One-dimensional and two-dimensional radiation hydrodynamics code developed by LLNL and used extensively at SNL, LANL, and LLNL for ICF target design calculations
LEVIS	Laser EVaporation Ion Source: active ion source that relies on a neodymium glass laser to evaporate neutrals from a surface; a tuned dye laser is then used to produce ionization by the LIBORS process
LIBORS	Laser Ionization Based On Resonant Saturation: method to ionize a neutral lithium vapor by using a dye laser tuned to the 670.8-nm line
LIBRA	Light Ion Beam ReActor: self-consistent reactor design developed by the University of Wisconsin and by KfK in Karlsruhe, Germany, using laser-generated transport channels

LIBRA-LiTE	Modified version of LIBRA using ballistic focus with an achromatic lens system
LIBRA-SP	Modified version of LIBRA using self-pinch transport
LiF	Lithium Fluoride ion source: passive ion source for producing the first high-energy Li^+ beam on PBFA II; the source operates by electron-assisted field desorption
LIF	Light Ion Fusion: ICF concept using light ions to drive a fusion target
lightning	Atmospheric phenomenon produced by electrical discharge between one cloud and another or between a cloud and the ground
LION	Light ION accelerator at Cornell University for studying ion sources, extraction diodes, and divergence reduction
lithography	Technique to imprint a micron scale pattern on the silicon wafer of an integrated circuit element by coating the wafer with a radiation-sensitive film and then illuminating the surface with light, x-rays, or electrons
LLE	Laboratory for Laser Energetics at the University of Rochester
LLNL	Lawrence Livermore National Laboratory
LMF	Laboratory Microfusion Facility: proposed single-shot pulsed power facility to produce high yield for defense applications
LMF/ETF	Possible LMF/ETF for defense and energy applications that would use middle-weight ions in a multigap accelerator
load	Metal in a pulsed power device to which electrical power is delivered
long conduction time	Conduction time of 100 ns or greater for a plasma opening switch
LTS	Laser-Triggered Switching: method used in PBFA II to synchronize the voltage pulses in the 36 pulse forming lines
MACH2	Two-dimensional MHD fluid code, developed by Mission Research Corporation and used to simulate plasma opening switch performance
MAGIC	Two-dimensional MHD fluid code developed by Mission Research Corporation; used to simulate POS performance
magnetically-driven implosion	Implosion in which a z pinch converts electrical energy into kinetic energy and then into soft x-rays, with the magnetic field of the z pinch confining the implosion; ; enclosing the z-pinch source within a hohlraum allows the soft x-rays to drive the fuel capsule
magnetized fuel target	Target design that employs magnetic fields to reduce thermal conduction and thereby reduce energy losses from the fuel by the capture of alpha particles; electron beam experiments with such a target, the so-called Phi Target, were done on the Hydra accelerator in 1976
MAP diode	Magnetically confined Anode Plasma ion diode: first ion diode capable of repetitive operation at rates up to 100 Hz; invented at Cornell University

Marshak wave	Radiation wave that propagates through hot material in front of a shock wave; named for R. E. Marshak, who did extensive work on radiative transfer theory in stars in the 1950s
Marx generator	Energy storage device used in large, single-shot pulsed power accelerators such as PBFA II
MCF	Magnetic Confinement Fusion: concept in which fusion fuel is confined magnetically for a long time within a large device (3-meter-scale) while thermonuclear reactions occur
McPIG	Micro-channel plate intensified grazing incidence spectrograph: time-resolved spectrograph used to infer target temperature and density
Mercury	Proposed pulsed-power accelerator at NRL to replace Gamble II
MHD	Magnetohydrodynamics: simulation technique that treats the motion of charged particles in a moving magnetic field
MI	Magnetically Insulated: electron flow, in which most electrons are retrapped at the cathode; also, method to exceed the limitations on power flow density imposed by material insulator breakdown
microdivergence	Divergence (spreading) of an ion beam on a small scale because of a residual net space charge
MID	Magnetically Insulated Diode: diode that employs a magnetic field to control electron behavior
MIP	Magnetically Injected Plasma: plasma source for an opening switch in which the injection process is controlled by an externally applied magnetic field
MITE	Magnetically Insulated Transmission Experiment: accelerator used during the design phase for PBFA I, the predecessor of the PBFA-II accelerator; now used for long-conduction-time plasma opening switch experiments
MITL	Magnetically Insulated Transmission Line: a transmission line in which most electrons are retrapped at the cathode
Monte Carlo technique	Technique involving the use of random sampling to obtain approximate solutions to physical and mathematical problems
multistage ion acceleration	Concept that uses two or more stages to increase the ion current in the final stage
negative polarity configuration	Accelerator configuration in which the cathode shank forms the center conductor of a coaxial MITL inductive voltage adder; electron beam accelerator configuration
neodymium glass laser	Solid laser in which the glass is doped with neodymium; Nova is an example
nuclear activation diagnostic	Detector that determines the presence of an element based upon the measurement and identification of radioactivity; can be used to measure average ion beam uniformity and total ion beam energy

NIF	National Ignition Facility: multi-laboratory project to achieve fusion and propagating burn in a neodymium glass laser facility
NLS	Neodymium Laser System: laser system used on PBFA II for the active lithium ion source LEVIS
Nova	Glass laser facility at LLNL that produces 30 kJ of 0.3-micron laser light in 1 ns for ICF and weapons physics experiments; internal pulse shaping experiments done on the Nova laser in an SNL/LLNL collaboration verify the IPS concept for ion beam drivers
NRL	Naval Research Laboratory
NWET	Nuclear Weapons Effects Testing
ONEDANT	One-dimensional LANL diffusion transport code for calculating neutron propagation from the target to the LMF reactor chamber walls
optically thin	Condition of matter such that light can pass through it without significant absorption
parallel load	See parasitic load
parasitic load	Observed load consisting of energetic ions that replaces the ion beam load on many barrel and extraction ion diodes late in time and causes diode impedance and diode voltage to drop; experimentally, defined as the difference between the total ion current in gas-cell current monitors and the lithium ions measured by a filtered Faraday Cup and by on-axis diagnostics such as the magnetic spectrometer
parallel plate transmission line	System of conductors consisting of two parallel metal plates with a dielectric filling the space between them
passive ion source	Source requiring power delivery to the diode before ions are generated
PBFA I	Particle Beam Fusion Accelerator I at SNL that was later modified to create the Saturn accelerator
PBFA II	Particle Beam Fusion Accelerator II at SNL that became operational in December 1985
PBFA X	Modification to PBFA II that includes an axially focusing, extraction ion diode
PBFA Z	Modification to PBFA II to allow generation of intense soft x-rays in z-pinch implosions for ICF-related physics experiments and simulation of weapons effects experiments
PCD	Photoconducting detector: rugged x-ray detector that has excellent time response and a low-Z composition (e.g., diamond) that minimizes the sensitivity to higher energy x-rays; an attractive replacement for the vacuum XRD and the p-i-n diode



PEOS

Plasma Erosion Opening Switch: opening switch that uses ion erosion rather than an externally applied magnetic field to control the switch

positive polarity configuration	Accelerator configuration in which the central conductor of the MITL inductive voltage adder is the anode shank; extraction ion beam accelerator configuration
preheat source	Source (ions, electrons, etc.) that heats a plasma before the main energy pulse arrives
PROTO I	Early applied-B, barrel-geometry ion diode machine used for proton beam focusing experiments in the mid 1980s
PTRAN	SNL Monte Carlo code for modeling ion scattering diagnostics
pulsed power	Diverse set of technologies for compressing electrical energy in space and time to produce intense electromagnetic pulses
QUICKSILVER	Multitasked, finite-difference, three-dimensional, fully-relativistic, electromagnetic, particle-in-cell simulation code developed at SNL for ion diode design and used, subsequently, for modeling other pulsed power devices
radial diode	Ion diode configuration in which an axisymmetric ion source is focused radially inward towards the center of a cylindrically symmetric device (A radial diode is the same as a barrel diode.)
radiation-hydrodynamics code	Computer code that calculates propagation of thermal radiation through a fluid and the effect of this radiation on the hydrodynamic motion of the fluid; at temperatures of millions of degrees in stars and in ICF targets, the energy and momentum of the radiation field are comparable to or dominate the corresponding fluid quantities
radiation smoothing	Improved radiation uniformity compared to the uniformity of the incident ion beam because of the symmetrization effect provided by the optically-thin foam within an ion-driven hohlraum
radiation transport code	Computer code that determines the propagation of thermal radiation within a fluid by solving the equation of radiative transfer
Reiden IV	Coaxial pulsed power light ion accelerator at the Institute of Laser Engineering at Osaka University; used for single-stage extraction ion diode experiments
Reiden SHVS	Inductive adder light ion accelerator (4 MV, 40 kA, 100 ns) that produces extracted ion beams at the Institute of Laser Engineering at Osaka University in Japan; used for two-stage extraction ion diode experiments
repetitive pulsed power	Compact technology that employs a motor driven alternator as the energy storage device and metglas magnetic switches for pulse compression and a firing rate of 10 Hz or greater; in contrast, "single shot" technology uses a Marx generator, laser triggered gas switching, and self-break water switching
RF glow discharge cleaning	Active method to improve ion source purity by using an RF discharge to remove anode and cathode impurities from diode surfaces in SABRE and PBFA II

RHALE	Three-dimensional, multi-material, arbitrary-Lagrangian-Eulerian radiation-hydrodynamics code being developed at SNL for designing and modeling pulsed-power-driven targets
RHEPP	Repetitive High Energy Pulsed Power: four-cavity linear induction voltage adder at Sandia that uses oil to insulate cathode electrons from the anode and has been operated in excess of 100 Hz
rimfire switch	Multistage gas switch developed to meet high-voltage, low-jitter requirements for PBFA II; the first stage is laser triggered
RING	Refractive INDEX Gradient: diagnostic for determining the expansion of a vapor or plasma
RT instability	Rayleigh-Taylor instability: instability in a gravitational field in which a dense fluid is above a less dense fluid; such an instability can reduce the yield of an ICF target
Rutherford scattering	Scattering of heavy charged particles by the Coulomb field of an atomic nucleus; can be used to determine the concentration of various species from the energy spectrum of backscattered ions
SABRE	Sandia Accelerator for Beam Research Experiments: 10-MV linear induction accelerator with a self-magnetically-insulated extraction diode for ion source, ion beam transport, and ion divergence studies
saturated distribution	Electron distribution extending uniformly from anode to cathode; this distribution is susceptible to impedance collapse
Saturn	Accelerator used primarily for weapons effects experiments and imploding z pinch experiments; so named because of the multi-ring geometry of the diodes when operated in a bremsstrahlung mode; Saturn is a reconfigured version of PBFA I
SCREAMER	One-dimensional code that uses circuit models to study the electrical behavior of PFLs, MITLs, and ion source loads
self-limited operation	MITL operation such that a loss occurs at the front of a forward-going electromagnetic wave that prevents wave reflection
self-pinched transport	Transport scheme in which the ion beam is ballistically focused to a small radius (< 1 cm) and then contained by the net self-magnetic field of the beam; self-pinched transport may be possible at < 1 Torr and/or with a laser preformed plasma
separatrix	Magnetic flux surface in a diode for which the stream function rA_{θ} is zero
SF ₆ gas	Insulating gas used in high voltage gas switches on PBFA II; the switch operates by laser triggered breakdown of the gas
shadowbox	Aperture plate diagnostic for recording ion damage patterns on a flat or curved surface (witness plate) located behind the gas cell window; the resultant damage patterns provide an estimate of beam divergence

shock breakout diagnostic	Temperature diagnostic based on difference in shock break through time at two portions of a stepped witness plate
SNL	Sandia National Laboratories
source divergence	Intrinsic divergence at the source produced, e.g., by nonuniformities and the thickness of the plasma source layer; can be a major contributor to overall beam divergence
soft x-ray radiation	Radiation extending from photon energies of 0.01 to 10 keV, corresponding to wavelengths of one to a thousand angstroms
SOPHIA	Transport/diagnostics code developed as an outgrowth of PICDIAG
space charge limited emission	Condition such that a plasma is of sufficient density and conductivity so that the electric field is normal to the plasma surface and vanishes at the surface
specific power deposition	Deposition in TW/g in a material
spectroscopic analysis	Technique of analyzing the components of a plasma by measuring the radiation emitted or absorbed; can be used to directly observe space- and time-resolved A-K gap charge dynamics
standoff	Extraction diode configuration in which the ion beam is transported several meters to the target
streak camera	Diagnostic for obtaining the continuous streak record of reflected laser light from a surface; used, for example, to determine the velocity of a shock wave, and hence a measure of the hohlraum temperature in an ICF target
superinsulated distribution	Electron distribution consisting of a thin, dense sheath confined to the physical cathode location; ion enhancement is about one in this case
SuperMITE	SNL accelerator used for power flow studies that originated as a demonstration module for PBFA II
SXPL	Soft X-ray Projection Lithography: method whereby a pattern is transferred by projection onto an object, using soft x-rays from a desktop-scale laser system
tamping	In an indirectly driven ion target, the slowing of the inward motion of the high-Z radiation case by the foam fill within the case
target positioner	Device to position a target within the NIF target chamber, such as a cantilevered pole with two rotational and three translation degrees of freedom
TEM analysis	Analysis using transverse electromagnetic waves
thermal target	ICF target in which the central portion--the fuel capsule--is driven by thermal (x-ray) radiation produced by laser or particle beam deposition in a high Z radiation case and, in the case of ion beams, by deposition in the foam within the radiation case

titanium gettering	Method to prevent recontamination of anode and cathode surfaces by differential vacuum pumping of liberated contaminants
titanium wire array diagnostic	Beam diagnostic consisting of three to five titanium strips at different azimuthal locations around a cylindrical target; used to measure the azimuthal symmetry and vertical focus of the ion beam
TL	Transmission Line
TLD	Thermoluminescent dosimeter: $\text{CaF}_2:\text{Mn}$ chip used as a radiation detector for measuring bremsstrahlung in a pulsed power accelerator
TOF	Time Of Flight: diagnostic to measure the time history of beam-produced neutrons or of DD or DT neutrons
TPX	Poly-4-methyl-pentene, CH_2 foam: low density foam used in light ion ICF hohlraums
transmission grating spectrograph	Diagnostic designed by SNL that disperses the x-ray spectrum onto photoconducting detectors
TRIDIF	Magnetic diffusion code using a triangular mesh that was developed at SNL in the 1970s by John Freeman to calculate time-dependent magnetic fields in two dimensions; uses either rectangular or cylindrical coordinates and can accurately treat slanted surfaces; not used as much now because of the difficulty in setting up the problem geometry compared to the ATHETA and DATHETA codes
TRXPC	Time-resolved x-ray pinhole camera: camera for obtaining time-resolved images of soft x-ray emission from an ion-beam-driven target in the 100 to 900 eV spectral range
TWOQUICK	Two-dimensional, fully-relativistic, electromagnetic, particle-in-cell simulation code developed at SNL for ion diode design and modeling; also used to model MITLs and POSs
two-stage diode	Extension to one-stage diode in which a third electrode is placed between the normal cathode and anode, thereby creating two acceleration gaps, with the beam injected from the first stage determining the current in the second stage; diode concept for a proposed light ion LMF that was tested, in 1994, on PBFA II
two-stream instability	Plasma electron/beam ion instability that causes longitudinal bunching of the ion beam; this classical plasma instability is affected by axial velocity spread and collision frequency
unfold method	Method to correct time response of diagnostics and associated cables
V^*	Limiting diode voltage at which the ion current diverges
V_{crit}	Voltage parameter defining the degree of magnetic insulation of electrons in an applied-B ion diode: $V_{\text{crit}} = cB_0d$, where B_0 is the gap field before the power pulse arrives and d is the initial (full) A-K gap; voltage below which the effective gap will go to zero

VIDA	Visual Ion Beam Diagnostics Analyzer
virtual cathode	Sheath region above the solid cathode surface of an applied-B diode that is filled with electrons
VUV	Vacuum ultraviolet portion of electromagnetic spectrum
wall-confined transport	See channel transport
wall plug efficiency	Efficiency of converting energy from the electrical power grid into ion beam energy; typically about 15% for ion beams
wire-guided transport	Transport scheme using the magnetic field of a current-carrying wire to confine an ion beam
XRD	X-Ray Diode: diagnostic based on the emission and collection of secondary photoelectrons; used to measure target temperature from blackbody emission in the 0.03 to 1 keV spectral range and to measure the x-ray power and yield from sources such as z pinches
XUV illumination	Illumination of a surface by light in the x-ray to ultraviolet range of the spectrum
Z_{flow}	Flow impedance: measure of how far an electron-charged cloud is from the anode of an MITL, given by the equation $V/(I_a^2 - I_c^2)^{1/2}$, with I_a and I_c the anode and cathode line currents, respectively, and V the voltage across the MITL; for a cathode that is a space-charge-limited emitter, flow impedance cannot be above the vacuum impedance of the transmission line
zinger	Location in a transmission line at which electron loss occurs because of a magnetic null; the location is characterized by the spalling of metal
z pinch load	Load that operates by sudden application of voltage to the ends of a plasma column, causing current to flow axially in the plasma

Meetings at Which Presentations Were Given

1989

American Association for Advancement of Science
Annual Meeting,
San Francisco, CA, *January 14-19, 1989*

Ninth Topical Conference on
High-Temperature Plasma Diagnostics,
Santa Fe, NM, *March 15-19, 1989*

Particle Accelerator Conference,
Chicago, IL, *March 20-23, 1989*

Conference on Lasers and Electro-Optics,
Baltimore, MD, *April 24-28, 1989*

16th IEEE International Conf. on Plasma Science,
Buffalo, NY, *May 22-24, 1989*

Fusion Power Associates Annual Meeting,
Washington, D. C., *June 1-2, 1989*

Defense Nuclear Agency Instrumentation for
Nuclear Weapons Effects Testing Conference,
Monterey, CA, *June 5-8, 1989*

Seventh IEEE Pulsed Power Conference,
Monterey, CA, *June 11-14, 1989*

International Workshop on Physics and Techniques
of High Power Opening Switches,
Novosibirsk, USSR, *July 1-2, 1989*

International Conference on Ion Sources,
Berkeley, CA, *July 10-14, 1989*

Sixth Plasma Opening Switch Workshop,
Albuquerque, NM, *August 24-25, 1989*

13th Conf. on Numerical Simulation of Plasmas,
Santa Fe, NM, *September 17-20, 1989*

Annual Meeting, New Mexico Academy of Science,
Albuquerque, NM, *September 22-23, 1989*

Fourth International Workshop on
Desorption Induced by Electronic Transitions,
Austria, *October 2-4, 1989*

Seventh American Physical Society Topical Conf on
Atomic Processes in Plasmas,
Gaithersburg, MD, *October 2-5, 1989*

National Academy of Sciences Review of ICF,
Univ. Rochester, NY, *October 23-25, 1989*

Ninth International Workshop on Laser Interaction
and Related Plasma Phenomena,
Monterey, CA, *November 6-8, 1989*

American Physical Society
Division of Plasma Physics Meeting,
Anaheim, CA, *November 13-17, 1989*

International Conference on Lasers 1989,
New Orleans, LA, *December 3-8, 1989*

1990

LMF Design Concept Review, DOE Headquarters,
Germantown, MD, *January 16-19, 1990*

Conference on Computer Codes
and the Linear Accelerator Community,
Los Alamos, NM, *January 22-25, 1990*

Fifth International Workshop on
Atomic Physics for Ion Driven Fusion,
Schliersee, Germany, *Jan 29-Feb 2, 1990*

Topical Conference on Research Trends in
Nonlinear and Relativistic Effects in Plasmas,
La Jolla, CA, *February 5-8, 1990*

American Physical Society Spring Meeting,
Washington, D.C., *April 16-19, 1990*

Seventh Plasma Opening Switch Workshop,
Albuquerque, NM, *April 24-25, 1990*

Eighth Topical Conference on
High-Temperature Plasma Diagnostics,
Hyannis, MA, *May 6-10, 1990*

National U.S. Decus Symposium,
New Orleans, LA, *May 7-11, 1990*

The Lightning Environmental Working Group,
Albuquerque, NM, *May 16, 1990*

17th IEEE International Conf. on Plasma Science,
Oakland, CA, *May 21-23, 1990*

Symposium on Optoelectronics for
Conventional and Nuclear Weapons,
Albuquerque, NM, *June 5-7, 1990*

19th IEEE Power Modulator Symposium,
San Diego, CA, *June 26-28, 1990*

Eighth International Conf. on
High-Power Particle Beams,
Novosibirsk, USSR, *July 2-5, 1990*

Defense Nuclear Agency
Advanced Pulsed Power Conference,
Albuquerque, NM, *July 31-August 3, 1990*

Europhysics Conference on Computational Physics,
Amsterdam, Netherlands, *Sept 10-13, 1990*

1990 Linear Accelerator Conference,
Albuquerque, NM, *September 10-14, 1990*

XIVth International Symposium on
Discharges and Electrical Insulation in Vacuum,
Santa Fe, NM, *September 17-20, 1990*

13th International Conference on
Plasma Physics and Controlled Nuclear Fusion,
Washington, D.C., *October 1-6, 1990*

Ninth Topical Meeting on
Technology of Fusion Energy,
Oak Brook, IL, *October 7-11, 1990*

SPIE Optically Activated Switching Conference,
Boston, MA, *November 5-6, 1990*

Third International Conference on
Intense Ion-Beam Interactions with Matter,
Albuquerque, NM, *November 7-8, 1990*

American Physical Society
Division of Plasma Physics Meeting,
Cincinnati, OH, *November 12-16, 1990*

Ninth Biennial CUBE Symposium,
Santa Fe, NM, *November 27-30, 1990*

1991

Physics of High Energy Density in Matter
Hirschegg, Austria, *February 3-9, 1991*

International Conference on Research Trends in
Inertial Confinement Fusion,
La Jolla, CA, *February 4-6, 1991*

Topical Mtg on Soft X-Ray Projection Lithography,
Monterey, CA, *April 10-12, 1991*

International Atomic Energy Agency Workshop on
Inertial Confinement Fusion Drivers,
Osaka, Japan, *April 15-19, 1991*

Particle Accelerator Conference,
San Francisco, CA, *May 6-9, 1991*

18th IEEE International Conf on Plasma Science,
Williamsburg, VA, *June 3-5, 1991*

Physics Computing '91 Conference,
San Jose, CA, *June 10-14, 1991*

Eighth IEEE Pulsed Power Conference,
San Diego, CA, *June 17-19, 1991*

Diagnostics for Contemporary Fusion Experiments
Course and Workshop,
Varenna, Italy, *August 27-September 6, 1991*

14th Intl Conf on Numerical Simulation of Plasmas,
Annapolis, MD, *September 3-6, 1991*

ILS-08 Interdisciplinary Laser Science Conference,
Monterey, CA, *September 22-26, 1991*

Eighth Target Fabrication Specialists' Meeting,
Albuquerque, NM, *September 23-26, 1991*

Magnetic Target Fusion Workshop,
Albuquerque, NM, *September 27, 1991*

Sixth Photonics Workshop,
Santa Barbara, CA, *October 2-4, 1991*

44th Annual Gaseous Electronics Conference,
Albuquerque, NM, *October 22-25, 1991*

American Physical Society
Division of Plasma Physics Meeting,
Tampa, FL, *November 4-8, 1991*

1992

Ninth International Workshop on
Laser Interaction and Related Plasma Phenomena,
Los Angeles, CA, *January 20-21, 1992*

Soft X-Rays in the 21st Century Conference,
Provo, Utah, *February 10-13, 1992*

Ninth Topical Conf on
High-Temperature Plasma Diagnostics,
Santa Fe, NM, *March 15-19, 1992*

Fusion Power Assoc. Annual Mtg and Symposium,
Pleasanton, CA, *April 9-10, 1992*

American Physical Society Spring Meeting,
Washington, D.C., *April 20-24, 1992*

Topical Mtg on
Electrical Performance of Electronic Packaging,
Tucson, AZ, *April 22-24, 1992*

MacNeal-Schwendler Corporation
1992 World User's Conference,
Dearborn, MI, *May 18-22, 1992*

Ninth International Conf on
High Power Particle Beams,
Washington, D.C., *May 25-29, 1992*

19th IEEE International Conf on Plasma Science,
Tampa, FL, *June 1-3, 1992*

Tenth Topical Mtg on Technology of Fusion Energy,
Boston, MA, *June 7-12, 1992*

20th IEEE Power Modulator Symposium,
Myrtle Beach, S.C., *June 23-25, 1992*

Fifth Strategic Defense Initiative Office/
Office of Naval Research Pulsed Power Meeting,
College Park, MD, *August 17-19, 1992*

Inter-Lab Magnetic Target Fusion Workshop,
Los Alamos, NM, *September 21, 1992*

European Research Conference on Nuclear Physics,
Aghia Pelaghia, Crete, *Sept 27-Oct 1, 1992*

14th International Conference on
Plasma Physics and Controlled Nuclear Fusion,
Wuerzburg, Germany, *Sept 30-Oct 7, 1992*

Russian-U.S. Technology Exchange in
Computations and Computer Science,
Livermore, CA, *October 19, 1992*

Tenth Biennial CUBE Symposium,
Pleasanton, CA, *October 27-30, 1992*

American Physical Society
Division of Plasma Physics Meeting,
Seattle, WA, *November 16-20, 1992*

International Conference on Lasers 1992,
Houston, TX, *December 7-10, 1992*

1993

Conference on Biomedical Optics,
Los Angeles, CA, *January 16-22, 1993*

Workshop on
Dynamic Response of Materials to Pulsed Heating,
Los Alamos, NM, *January 22-26, 1993*

Physics of High Energy Density in Matter,
Hirschegg, Austria, *Jan 31-Feb 5, 1993*

Topical Mtg on Soft X-Ray Projection Lithography,
Monterey, CA, *May 10-12, 1993*

1993 Particle Accelerator Conference,
Washington, D.C., *May 17-20, 1993*

Sixth Intl Symposium on Heavy Ion Fusion,
Frascati, Italy, *May 25-28, 1993*

20th IEEE International Conf on Plasma Science,
Vancouver, B.C., *June 7-9, 1993*

Ninth IEEE Pulsed Power Conference,
Albuquerque, NM, *June 21-23, 1993*

Joint AIRPT/APS Conference on
High Pressure Science and Technology,
Colorado Springs, CO, *June 28-July 2, 1993*

SPIE International Symposium on
Optical Instrumentation and Applied Science,
San Diego, CA, *July 11-16, 1993*

Ninth American Physical Society Topical Conf on
Atomic Processes in Plasmas,
San Antonio, TX, *September 19-23, 1993*

Seventh International Conference on
Emerging Nuclear Energy Systems,
Makuhari, Chiba, Japan, *September 20-24, 1993*

European Research Conference on
Prospects for Heavy Ion Inertial Fusion,
Aghia Pelaghia, Crete, *Sept 23-Oct 1, 1993*

Symposium on Near-Term Applications of
Fusion and Plasma Technology,
Oak Ridge, TN, *October 5-7, 1993*

1993 Workshop on
Status of ICF Research Programmes and
Conceptual ICF Reactor Studies,
KfK, Karlsruhe, Germany, *October 18-20, 1993*

11th International Conference on
Laser Interaction and Related Plasma Phenomena,
Monterey, CA, *October 25-29, 1993*

American Physical Society
Division of Plasma Physics Meeting,
St. Louis, MO, *November 1-5, 1993*

Sixth International Workshop on
Atomic Physics for Ion-Driven Fusion,
Santa Fe, NM, November 8-12, 1993

Topical Index, Arranged Chronologically

A. Reviews

J. P. VanDevender, "Light Ion Driven ICF," American Association for Advancement of Science Annual Meeting, San Francisco, CA, January 14-19, 1989 (invited talk).

J. P. Quintenz, J. E. Bailey, K. W. Bieg, D. D. Bloomquist, D. L. Cook, J. T. Crow, R. S. Coats, M. S. Derzon, M. P. Desjarlais, P. L. Dreike, R. A. Gerber, T. W. Hussey, D. J. Johnson, W. A. Johnson, R. P. Kensek, G. W. Kuswa, J. R. Lee, R. J. Leeper, T. R. Lockner, J. E. Maenchen, D. H. McDaniel, P. F. McKay, T. A. Mehlhorn, C. W. Mendel, Jr., L. P. Mix, E. L. Neau, C. L. Olson, T. D. Pointon, A. L. Pregonzer, T. J. Renk, G. E. Rochau, S. E. Rosenthal, C. L. Ruiz, L. X. Schneider, S. A. Slutz, R. W. Stinnett, W. A. Stygar, M. A. Sweeney, G. C. Tisone, B. N. Turman, J. P. VanDevender, J. R. Woodworth, "Status of the PBFA-II Light Ion Beam Fusion Program," Particle Accelerator Conference, Chicago, IL, March 20-23, 1989 (invited talk).

J. P. VanDevender, J. E. Bailey, K. W. Bieg, D. L. Cook, M. P. Desjarlais, R. A. Gerber, S. A. Goldstein, R. A. Hamil, G. T. Holman, D. J. Johnson, D. L. Johnson, P. R. Johnson, W. A. Johnson, R. J. Leeper, T. R. Lockner, T. H. Martin, P. F. McKay, J. E. Maenchen, D. H. McDaniel, T. A. Mehlhorn, C. W. Mendel, Jr., W. B. S. Moore, E. L. Neau, S. S. Payne, K. J. Penn, J. W. Poukey, A. L. Pregonzer, K. R. Prestwich, J. P. Quintenz, J. J. Ramirez, T. J. Renk, C. L. Ruiz, G. E. Rochau, S. E. Rosenthal, W. W. Simpson, S. A. Slutz, R. W. Stinnett, W. A. Stygar, M. A. Sweeney, J. T. Crow, B. N. Turman, J. M. Wilson, J. R. Woodworth, D. M. Zagar, "Progress Towards Inertial Fusion with Light Ion Beams at Sandia National Laboratories," *12th Conference Proceedings, Plasma Physics and Controlled Nuclear Fusion Research 1988* (IAEA, Vienna, 1989), vol. 3, p. 99 (invited paper).

J. P. Quintenz, J. E. Bailey, K. W. Bieg, D. D. Bloomquist, D. L. Cook, J. T. Crow, R. S. Coats, M. S. Derzon, M. P. Desjarlais, P. L. Dreike, R. A. Gerber, T. W. Hussey, D. J. Johnson, W. A. Johnson, R. P. Kensek, G. W. Kuswa, J. R. Lee, R. J. Leeper, T. R. Lockner, J. E. Maenchen, D. H. McDaniel, P. F. McKay, T. A. Mehlhorn, C. W. Mendel, L. P. Mix, E. L. Neau, C. L. Olson, T. D. Pointon, A. L. Pregonzer, W. A. Stygar, M. A. Sweeney, G. C. Tisone, B. N. Turman, J. P. VanDevender, J. R. Woodworth, "Status of the PBFA-II Light Ion Beam Fusion Program," *Proceedings 1989 IEEE Particle Accelerator Conference*, ed. by F. Bennett and J. Kopta (IEEE, New York, 1989), vol. 2, p. 752 (invited paper).

R. W. Stinnett, T. R. Lockner, D. J. Johnson, R. S. Coats, T. A. Mehlhorn, M. P. Desjarlais, K. W. Bieg, A. L. Pregonzer, J. R. Woodworth, R. J. Leeper, J. E. Maenchen, C. L. Ruiz, W. A. Stygar, J. E. Bailey, R. P. Kensek, J. P. Quintenz, S. E. Rosenthal, S. A. Slutz, D. L. Hanson, P. F. McKay, "Progress in Ion Beam Research at Sandia National Laboratories," 16th IEEE International Conference on Plasma Science, Buffalo, NY, May 22-24, 1989 (invited talk).

J. P. VanDevender, "Status of Light Ion Approach to Inertial Confinement Fusion," Fusion Power Associates Annual Meeting, Washington, D. C., June 1-2, 1989 (invited talk).

K. R. Prestwich, "Erwin Marx Lecture," Seventh IEEE Pulsed Power Conference, Monterey, CA, June 11-14, 1989 (invited talk).

J. P. VanDevender, "Pulsed Power Switching for Inertial Confinement Fusion with Light Ion Beams," International Workshop on Physics and Techniques of High Power Opening Switches, Novosibirsk, USSR, July 1-2, 1989 (invited talk).

J. P. VanDevender, "Pulsed Power Switching for Inertial Confinement Fusion with Light Ion Beams," *Proceedings International Workshop on Physics and Techniques of High Power Opening Switches*, ed. by V. Bystritski (Tomsk Institute of High Current Electronics, Tomsk, USSR, 1989), p. 77 (invited paper).

J. J. Ramirez, "Light Ion Beam Drivers for ICF," Ninth International Workshop on Laser Interaction and Related Plasma Phenomena, Monterey, CA, November 6-8, 1989.

D. L. Cook, J. E. Bailey, K. W. Bieg, D. D. Bloomquist, R. S. Coats, G. A. Chandler, M. E. Cuneo, M. S. Derzon, M. P. Desjarlais, P. L. Dreike, R. J. Dukart, R. A. Gerber, D. J. Johnson, R. J. Leeper, T. R. Lockner, D. H. McDaniel, J. E. Maenchen, M. K. Matzen, T. A. Mehlhorn, L. P. Mix, A. R. Moats, W. E. Nelson, T. D. Pointon, A. L. Pregoner, J. P. Quintenz, T. J. Renk, S. E. Rosenthal, C. L. Ruiz, S. A. Slutz, R. W. Stinnett, W. A. Stygar, G. C. Tisone, J. R. Woodworth, J. P. VanDevender, "Inertial Confinement Fusion Using Light Ion Beams," Topical Conference on Research Trends in Nonlinear and Relativistic Effects in Plasmas, La Jolla, CA, February 5-8, 1990.

J. P. VanDevender, "Physics and Applications of Pulsed Power Research and Accelerator Technology," 17th IEEE International Conference on Plasma Science, Oakland, CA, May 21-23, 1990 (invited talk).

D. L. Cook, "Pulsed Power Technologies for Fusion Research on PBFA II and Beyond," Advanced Pulsed Power Conference, Albuquerque, NM, July 31-August 3, 1990 (invited talk).

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