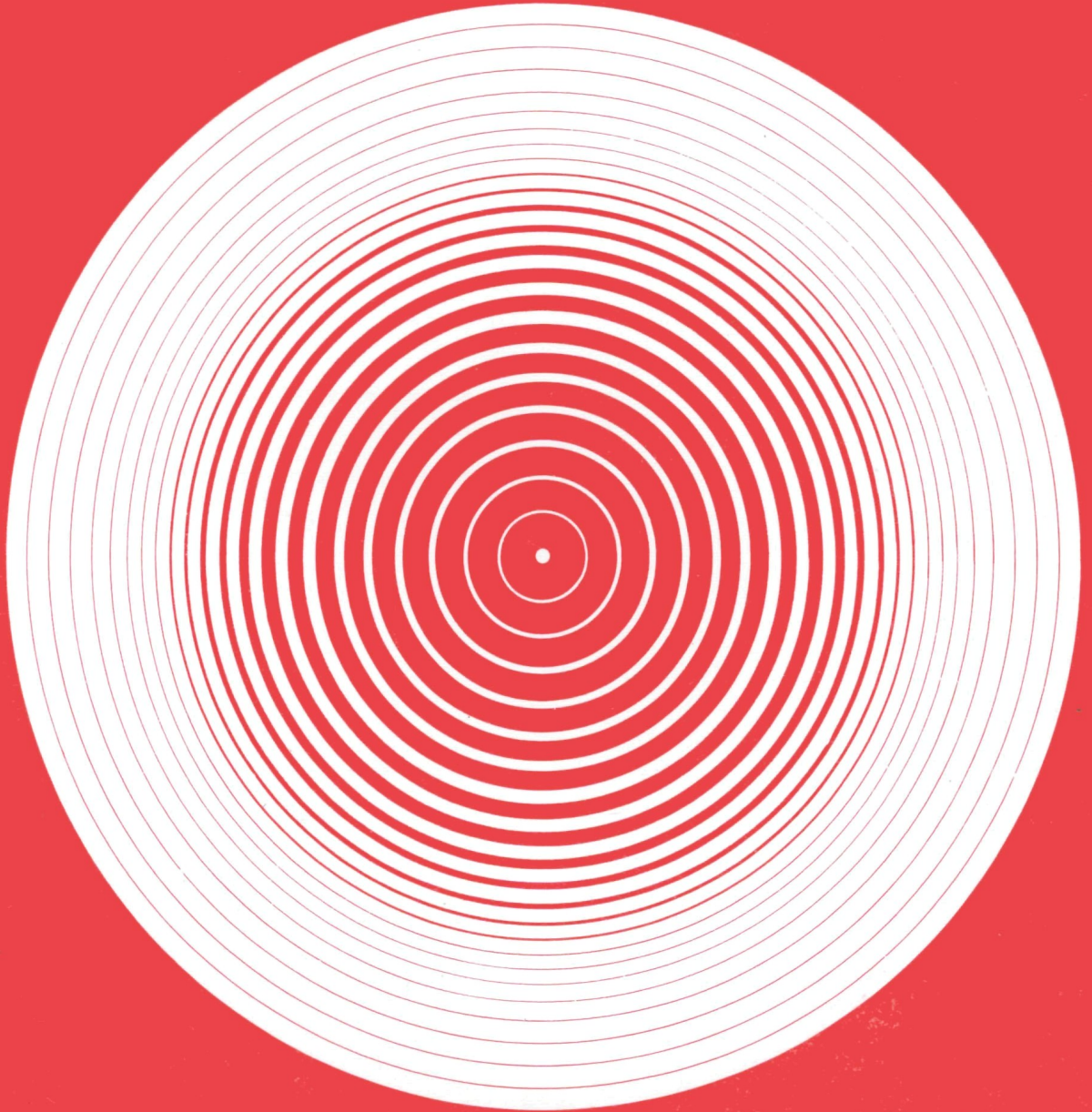


LASER AND PARTICLE BEAMS

VOLUME 8 NUMBERS 1-2

PULSE POWER AND HIGH ENERGY DENSITIES
19th ECLIM ISSUE



Laser and Particle Beams

Pulse Power and High Energy Densities

Editor in Chief: HEINRICH HORA
Head, Department of Theoretical Physics
University of New South Wales
Kensington 2033, Australia

Managing (and USA) Editor:
G. H. MILEY (for USA)
Director, Fusion Studies Laboratory,
University of Illinois,
103 S. Goodwin Ave, Urbana, Il. 61801,
USA

Associate Editors:
R. DAUTRAY (for Europe)
Scientific Director, CEA Limeil, B.P. 27
94190 Villeneuve St. Georges, France
A. H. GUENTHER (for Pulse Power)
Chief Scientist (Adv. Def. Tech.),
Los Alamos Nat. Laboratory,
Los Alamos, NM 87545,
USA
C. YAMANAKA (for Japan)
Director, Institute of Laser Engineering,
Osaka University, Suita,
565 Osaka, Japan

Editorial Board
N. G. Basov (Moscow)
P. van Devender (Albuquerque)
S. Eliezer (Soreq, Israel)
J. L. Emmett (Livermore)
A. J. Glass (San Francisco)
R. J. Jensen (Los Alamos)
G. Kessler (Karlsruhe)
M. H. Key (Rutherford Appleton Lab.)
M. Kristiansen (Pulse Power Lab,
Texas Tech)
R. L. McCrory (Rochester)
P. Mulser (Darmstadt)
S. Nakai (Osaka)
K. Niu (Nagatsuta)
A. A. Offenberger (Alberta)
A. M. Prokhorov (Moscow)
B. Ripin (Washington)
D. D. Ryutov (Novosibirsk)
E. Storm (Livermore)
J. P. Watteau (CEA Limeil)

Laser and Particle Beams is an international journal which covers the generation, and the interaction with matter, of high intensity laser and particle beams. It also covers the physics of systems with high energy densities. Specific fields of interest include nuclear fusion, especially inertial confinement, magnetic confinement, diagnostics, material treatment, laboratory astrophysics, plasmas and spectroscopy at extreme conditions, physical properties of hot dense matter and intense particle beams and optical (laser) beams from the microwave to the X-ray region. The exploration of these fields and their new physics, including nonlinear and nonclassical phenomena, should find a forum in this journal.

As well as publishing original articles the journal also publishes occasional review articles, surveys of research at particular laboratories and reviews of recent books.

©Cambridge University Press 1990

Copying: This journal is registered with the Copyright Clearance Center, 27 Congress St., Salem, Mass. 01970. Organizations in the USA who are also registered with C.C.C. may therefore copy material (beyond the limits permitted by sections 107 and 108 of US copyright law) subject to payment to C.C.C. of the per copy fee of \$05.00. This consent does not extend to multiple copying for promotional or commercial purposes. Code 5/0263-0346/90/\$5.00 + 00.

ISI Tear Sheet Service, 3501 Market Street, Philadelphia, Pennsylvania 19104, USA, is authorized to supply single copies of separate articles for private use only.

For all other use, permission must be sought from Cambridge University Press.

Subscriptions: *Laser and Particle Beams* (ISSN 0263-0346) is published quarterly. The subscription price (which includes postage) of Volume 8, 1990 is US \$205 for the US and Canada (£99 in UK: £112 elsewhere). Single parts cost US \$55 for the US and Canada (£31 elsewhere) plus postage. Four parts form a volume. Orders, which must be accompanied by payment, may be sent to a bookseller, subscription agent, or direct to the publishers: Cambridge University Press, Journals Department, 40 West 20th Street, New York, NY 10011, USA; orders outside the US or Canada may be sent to Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU, England. Claims for missing issues should be made immediately after receipt of the next issue. POSTMASTER: Send address changes in the US and Canada to *Laser and Particle Beams*, Cambridge University Press, 110 Midland Avenue, Port Chester, NY 10573.

LASER AND PARTICLE BEAMS
Pulse Power and High Energy Densities

19th ECLIM
October 3–7, 1988, Madrid, Spain

Guillermo Velarde
Guest Editor and Conference Chairman

LASER AND PARTICLE BEAMS

Pulse Power and High Energy Densities

19th European Conference on Laser Interaction with Matter
October 3–7, 1988, Madrid, Spain

Vol. 8, Nos. 1–2, January–March 1990

Preface 1

C. Yamanaka (Osaka University, Japan): Laser driven implosion 3

M. H. Key, M. Grande, C. Hooker, S. Rose, I. Ross, M. Shaw, G. Tallents (Rutherford Lab., Appleton, UK), H. Baldis (Naval Research Centre, Ottawa, Canada), D. Brown, P. Norreys, E. Wooding (Royal Holloway and Bedford New College, UK), G. Pert (U. of York, UK), S. Ramsden (U. of Hull, UK), C. Lewis, D. O'Neill, C. Regan (Queens U. Belfast, UK), and Y. Kato (Osaka University, Japan): High power laser development and experimental applications to X-ray lasers, and short pulse energy transport 19

R. L. McCrory, J. M. Soures, C. P. Verdon, F. J. Marshall, S. A. Letzring, T. J. Kessler, J. P. Knauer, H. Kim, R. L. Kremens, S. Skupsky, R. L. Keck, D. K. Bradley, W. D. Seka, P. A. Jaanimagi, J. A. Delettrez, and P. W. McKenty (University of Rochester, Rochester, NY, USA): High-density, direct-drive implosion experiments 27

M. P. Goldsworthy, H. Hora, and R. J. Stening (UNSW, Kensington, Australia): Double layer effects causing nearly uniform striated second harmonic emission from a laser irradiated plasma corona 33

J. C. V. Hansom, P. A. Rosen, T. J. Goldack, K. Oades, P. Fieldhouse, N. Cowperthwaite, D. L. Youngs, N. Mawhinney, and A. J. Baxter (Atomic Weapons Establishment, Reading, UK): Radiation-driven planar foil instability and mix experiments at the AWE HELEN laser 51

R. Fabbro, B. Faral, J. C. Gauthier, C. Chenais-Popovics, J. P. Geindre (Ecole Polytechnique, Palaiseau, France), and H. Pepin (INRS, Montreal, Canada): Study of the emissivity of the rear face of a shocked foil with temporal and X-UV spectral resolution in single and colliding foil experiments 73

W. B. Herrmannsfeldt (Stanford University, Stanford, CA, USA) and D. Keefe (U. of California, Berkeley, CA, USA): Induction linac drivers for heavy ion fusion 81

T. Aoki and K. Niu (Tokyo Institute of Technology, Japan): 2-D simulation for focus of rotating and propagating ion beam in neutral gas 89

R. C. Mancini and C. F. Hooper, Jr. (University of Florida, Gainesville, FL, USA): Atomic physics and hydrodynamics of laser driven Ar-filled plastic microballoon implosions 95

E. Mínguez and M. L. Gámez (DENIM, Madrid, Spain): Analysis of atomic physics models for the multigroup opacities calculation 103

J. J. Honrubia (DENIM, Madrid, Spain): A multigroup radiation analysis of the light ion beam energy conversion into X-rays 117

C. Strangio and A. Caruso (EURATOM-ENEA, Rome, Italy): Interaction of integrated beams with thin foils and microballoons 135

- J. Limpouch, G. Lončar (Technical U. of Prague, Czechoslovakia), and R. Dragila (The Australian National U., Canberra, Australia):** Laser beam filamentation in a plasma with a steep density profile 143
- A. A. Offenberger, J. Santiago, M. Fujita, R. Fedosejevs, and W. Rozmus (U. of Alberta, Edmonton, Alberta, Canada):** Stimulated scattering from laser produced plasma 153
- E. G. Gamaly, I. G. Lebo, V. B. Rozanov (Lebedev Inst., Moscow, USSR), A. P. Favorsky, A. O. Fedyanin, E. E. Myshetskaya, and V. F. Tishkin (Keldysh Inst. Moscow, USSR):** Non-linear stage in the development of hydrodynamic instability in laser targets 173
- B. H. Ripin, C. K. Manka, T. A. Peyser, E. A. McLean, J. A. Stamper, A. N. Mostovych, J. Grun, K. Kearney, J. R. Crawford, and J. D. Huba (Naval Research Lab., Washington, DC, USA):** Laboratory laser-produced astrophysical-like plasmas 183
- H. Fiedorowicz and M. Kolanowski (IPPLM, Warsaw, Poland):** Effect of the hydrodynamic instability on the burn-through time measurements 191
- L. R. Foreman and J. K. Hoffer (LANL, Los Alamos, NM, USA):** Fabrication of ICF reactor targets based on symmetrization of solid fuel 197
- R. Suchańska and W. Muniak (IPPLM, Warsaw, Poland):** Laser targets fabrication technologies 203
- T. J. H. Pättikangas and R. R. E. Salomaa (Helsinki U. of Technology, Finland):** Dynamics of double stimulated Brillouin scattering 209
- S. Atzeni (EURATOM-ENEA, Rome, Italy):** 2-D studies of non-uniformly irradiated spherical shells 227
- S. R. Borodziuk and J. L. Kostecki (IPPLM, Warsaw, Poland):** Studies of hypervelocity impact problem by means of laser-target experiments—A new approach 241
- M. A. Harith, V. Palleschi, A. Salvetti, D. P. Singh, G. Tropiano, and M. Vaselli (Ist. di Fisica, Pisa, Italy):** Hydrodynamic evolution of laser driven diverging shock waves 247
- D. P. Singh, M. A. Harith, V. Palleschi, G. Tropiano, M. Vaselli (Ist. di Fisica, Pisa, Italy), N. Salingaros (U. of Texas, San Antonio, TX, USA), and E. Panarella (Advanced Laser and Fusion Technology, Inc., Ottawa, Canada):** The spherical pinch: Generalized scaling laws and experimental verification of the stability of imploding shock waves in spherical geometry 253
- T. Błęński and J. Ligou (Ecole Polytechnique Federale de Lausanne, Switzerland):** Calculations of radiation opacity for high Z elements 265
- C. R. Phipps, Jr., R. F. Harrison, T. Shimada, G. W. York, T. P. Turner, X. F. Corlis, H. S. Steele, L. C. Haynes (LANL, Los Alamos, NM, USA), and T. R. King (Boeing Aerospace Co., Seattle, WA, USA):** Enhanced vacuum laser-impulse coupling by volume absorption at infrared wavelengths 281
- T. Tomie, I. Okuda, Y. Owadano, M. Tanimoto, Y. Matsumoto, S. Komeiji, K. Koyama, I. Matsushima, A. Yaoita, and M. Yano (Electrotech. Lab., Tsukuba, Ibaraki, Japan):** Pico-second high power KrF laser system for X-ray laser research 299
- J. P. Bardet, J. L. Bobin, C. Dimarcq, L. Giry, J. B. Larour, J. C. Valognes, and M. A. Zaibi (Univ. Pierre et Marie Curie, Paris, France):** Spectral diagnostic of a resonantly laser created plasma 307

A. Djaoui, T. A. Hall (University of Essex, UK), R. C. Albers (LANL, Los Alamos, NM, USA), J. J. Rehr and J. Mustre (University of Washington, Seattle, WA, USA): Calculation of X-ray absorption structure above K-edge of laser shock-compressed aluminum 319

J. E. Balmer, R. Weber, P. F. Cunningham, and P. Lädach (University of Bern, Switzerland): Plasma evolution in laser-irradiated hollow microcylinders 327

Yu. A. Zakharenkov, A. V. Kosterin, A. S. Shikanov (Lebedev Inst., Moscow, USSR), V. V. Pikalov, and N. G. Preobrazhensky (Inst. for Pure & Applied Mechanics, Novosibirsk, USSR): Laser produced plasma refractometry 339

Q. Lou (Academia Sinica, Shanghai, China): Research on the conversion effects of pulsed laser plasma electric signal 343

S. G. Lukishova (USSR Academy of Sciences, Moscow, USSR), P. P. Pashinin, S. K. Batygov (Inst. of General Physics, Moscow, USSR), V. A. Arkhangelskaya, A. E. Poletimov, A. S. Scheulin (State Optical Inst., Leningrad, USSR), and B. M. Terentiev (All-Union Inst. of Radiation Engineering, Moscow, USSR): High-power laser beam shaping using apodized apertures 349

J. A. Waltham, M. Notcutt, P. F. Cunningham, and M. M. Michaelis (University of Natal, Durban, South Africa): Evaluation of gas lens laser-produced plasmas 361

Book Reviews by H. Hora 369