

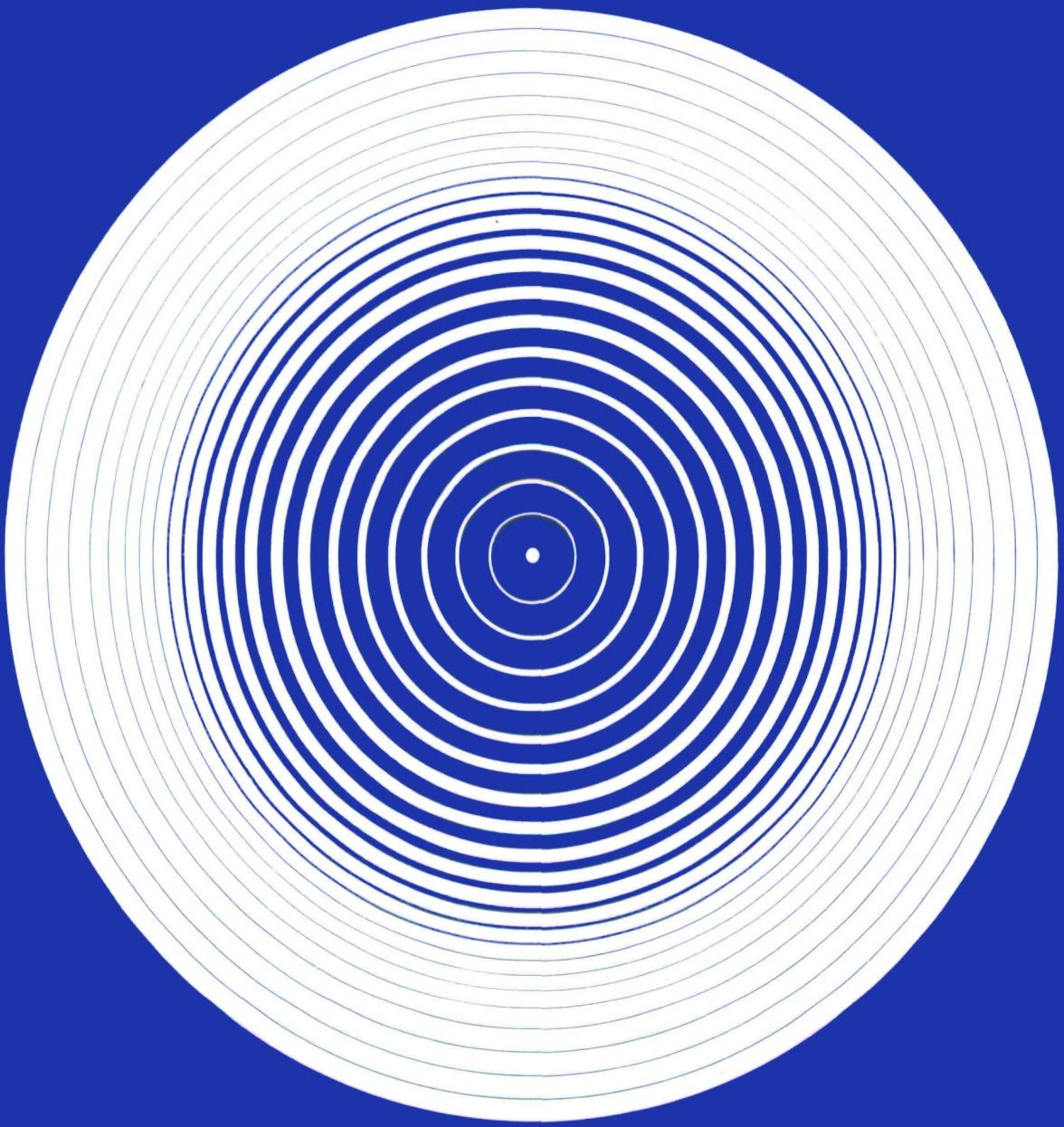
# LASER AND PARTICLE BEAMS

PULSE POWER AND HIGH ENERGY DENSITIES

SPECIAL ISSUE: Hirschegg Conference

on High Energy Density in Matter

VOLUME 15 NUMBER 4  
1997



CAMBRIDGE  
UNIVERSITY PRESS

# Laser and Particle Beams

## Pulse Power and High Energy Densities

**Editor in Chief:**

G. H. MILEY  
 Director, Fusion Studies Laboratory,  
 University of Illinois,  
 103 S. Goodwin Ave,  
 Urbana, IL 61801, USA

**Emeritus Editor in Chief:**

HEINRICH HORA  
 Professor Emeritus  
 University of New South Wales  
 Kensington 2033, Australia

**Associate Editors:**

J.P. QUINTENZ (for Pulse Power)  
 Sandia National Laboratories  
 P.O. Box 5800, MS 1195  
 Albuquerque, NM 87185-1195  
 C. YAMANAKA (for Japan)  
 Director, Institute for Laser Technology,  
 Osaka University, Suita,  
 565 Osaka, Japan

**Editorial Board**

- N. G. Basov (P.N. Lebedev Physical Inst.)
- E. M. Campbell (Lawrence Livermore Nat. Lab.)
- A. Caruso (ENEA Frascati)
- M. Decroissette (Centre d' Etudes de Limeil-Valenton)
- S. Eliezer (SOREQ)
- A. A. Hauer (Los Alamos National Laboratory)
- W. B. Herrmannsfeldt (Stanford Linear Accelerator Center)
- D. H. H. Hoffmann (Universität Erlangen-Nürnberg)
- G. Kessler (Forschungszentrum Karlsruhe)
- M. H. Key (Rutherford Appleton Lab.)
- M. Kristiansen (Texas Tech)
- R. L. McCrory (Laboratory for Laser Energetics)
- G. A. Mesyats (Institute for Electrophysics, RAS)
- J. Meyer-ter-Vehn (Max-Planck-Institut für Quantenoptik)
- P. Mulser (Technische Hochschule Darmstadt)
- S. Nakai (Institute for Laser Engineering)
- A. Ng (U. British Columbia)
- K. Niu (Teikyo Univ. of Tech.)
- A. A. Offenberger (Univ. of Alberta)
- A. M. Prokhorov (General Physics Institute, RAS)
- D. D. Ryutov (Budker Inst. of Nuclear Phys.)
- A. S. Shikanov (P.N. Lebedev Physical Inst.)
- V. F. Tarasenko (High Current Electronics Inst.)
- A. V. Zrodnikov (Inst. of Phys. and Power Eng.)

**Laser and Particle Beams** is an international journal that 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 1997

**Copying:** This journal is registered with the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. 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 \$11.00 + .10. This consent does not extend to multiple copying for promotional or commercial purposes. Code 5/0263-0346/97 \$11.00 + .10.

ISI Tear Sheet Service, 3501 Market Street, Philadelphia, PA 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 for institutions (which includes postage) of Volume 15, 1997, is US \$375 for the US, Mexico, and Canada (UK £202+VAT elsewhere). Individual rates: US \$99 in the US, Mexico, and Canada; UK £66+VAT elsewhere. Single parts cost US \$95 for the US, Mexico, and Canada (UK £55+VAT 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 10011-4211, USA; orders outside the US, Canada, or Mexico 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, Mexico, and Canada to *Laser and Particle Beams*, Cambridge University Press, 110 Midland Avenue, Port Chester, NY 10573-9864.

Periodicals Postage paid at New York, NY, and at additional mailing offices.

*Special Issue*

**LASER AND PARTICLE BEAMS**  
Pulse Power and High Energy Densities

Hirschgegg Conference on High Energy  
Density in Matter

Guest Editor  
Hansjoachim Bluhm



# LASER AND PARTICLE BEAMS

Pulse Power and High Energy Densities

Volume 15, Number 4, 1997

## SPECIAL ISSUE

### Hirschegg Conference on High Energy Density in Matter

**Hansjoachim Bluhm:** Guest Editor's Preface 483

**Simone Bossi, Tom A. Hall, Mohammed Mahdiah** (Univ. of Essex, Colchester, United Kingdom), **Dimitri Batani** (Univ. of Milan, Milan, Italy), **Michel Koenig, Jothy Krishnan, Alessandra Benuzzi, Jean Michel Boudenne** (LULI, Ecole Polytechnique, Palaiseau, France), and **Thorsten Löwer** (Max-Planck-Institut für Quantenoptik, Garching, Munich, Germany): Determination of the color temperature in laser-produced shocks 485

**N.A. Inogamov** (Landau Inst. for Theoretical Physics, Moscow, Russian Federation): Ablative acceleration of foils, their pulsations, and interchange instability 495

**K. Morawetz** (Max-Planck-Gesellschaft, Theoretische Vielteilchenphysik an der Universität Rostock, Rostock, Germany): Stopping power in strongly coupled plasmas 507

**D.O. Gericke, M. Schlanges, and W.D. Kraeft** (E.-M.-Arndt Univ., Greifswald, Germany): T-matrix approximation of the stopping power 523

**J. Riemann, M. Schlanges, and W.D. Kraeft** (E.-M.-Arndt Univ., Greifswald, Germany): Density expansion of the equation of state for a multicomponent quantum plasma 533

**S. Hain and P. Mulser** (Institut für Angewandte Physik, Technische Hochschule Darmstadt, Hochschulstr., Darmstadt, Germany): Fast ignitor: Fluid dynamics of channel formation and laser beam propagation 541

**C. Deutsch, H. Furukawa, K. Mima, M. Murakami, and K. Nishihara** (Inst. for Laser Engineering, Osaka Univ., Osaka, Japan): The interaction physics of the fast ignitor concept 557

**Chr. Scheffel, R. J. Stening** (Anwenderzentrum, Inst. of Technology, Regensburg, Germany), **H. Hora** (Univ. of New South Wales, Sydney, Australia), **R. Höpfl** (Inst. of Technology, Deggendorf, Germany), **J.M. Martinez-Val, S. Eliezer, M. Piera** (Inst. of Nuclear Fusion, Polytech. Univ. of Madrid, Spain) and **G. Kasotakis and E. Sarris** (National Astronomical Observatory, Athens, Greece): Analysis of the retrograde hydrogen boron fusion gains at inertial confinement fusion with volume ignition 565

**N.A. Tahir and D.H.H. Hoffmann** (Physikalisches Institut, Universität Erlangen, Erlangen, Germany): Development of advanced fuel inertial fusion targets 575

**E. Eberl, T. Wagner, J. Jacoby, A. Tauschwitz, D.H.H. Hoffmann** (Physikalisches Institut I, Universität Erlangen-Nürnberg, Erlangen, Germany): Soft X-ray lasing at 519.7 Å in a recombining Z-pinch plasma 589

**Yu. V. Petrov** (L.D. Landau Inst. for Theoretical Physics, Chernogolovka, Moscow, Russia): Solids in strong magnetic fields at high pressures: Static properties and lattice dynamics 597

## Regular Papers

**E. Michael Campbell, Neil C. Holmes, Steven B. Libby, Bruce A. Remington, and Edward Teller** (Lawrence Livermore National Laboratory, Livermore, California): The evolution of high-energy-density physics: From nuclear testing to the superlasers 607

**N.Y. Orlov** (Inst. of Mathematical Modelling, Moscow, Russia): Ion model of a hot dense plasma 627

**Book Review: Heinrich Hora** 635

**Index** 637

**Contents of Volume 15** 641