

**JOURNAL OF
PLASMA PHYSICS**

JOURNAL OF PLASMA PHYSICS exists for the publication of experimental and theoretical research papers on plasma physics and its applications.

EDITOR

DR J. P. DOUGHERTY

*Department of Applied Mathematics and Theoretical Physics, University of Cambridge,
Silver Street, Cambridge CB3 9EW, England*

ASSOCIATE EDITORS

PROF. D. BERSHADER

*Department of Aeronautics and Astronautics,
Stanford University, Stanford, California, 94305, USA*

PROF. F. D. KAHN

*Department of Astronomy,
University of Manchester, Manchester M13 9PL, England*

PROF. W. B. THOMPSON

*Department of Physics,
University of California, La Jolla, California 92093, USA*

Authors wishing to have papers published in the **JOURNAL** should communicate them to any one of the persons named above, choosing one in their own country where possible.

Authors are urged to ensure that their papers are written clearly and attractively, in order that their work will be readily accessible to readers.

Manuscripts should be typed in double spacing on one side of the paper only, with references listed at the end in alphabetical order of authors. Drawings should be done in Indian ink on plain white or transparent paper, and should not be larger than 15 in. by 24 in. Lettering should be shown clearly in pencil for reproduction by the printer, and as far as possible information relating to a figure should be placed in the caption rather than on the figure. A typed list of captions should be provided at the end of the manuscript. Proofs of papers from overseas will usually be despatched to authors by airmail. There is no charge for publication. Authors are entitled to receive 50 offprints of a paper in the **JOURNAL** free of charge, and additional offprints can be purchased if ordered in advance.

© Cambridge University Press 1987

Copying

This journal is registered with the Copyright Clearance Center, 21 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 0022-3778/85/2828-0001 \$05.00.

IS Tear 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 should be sought from Cambridge or the American Branch of Cambridge University Press.

JOURNAL OF PLASMA PHYSICS (ISSN 0022-3778) is published once every two months in February, April, June, August, October and December, by Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge CB2 2RU and 32 East 57th Street, New York, NY 10022.

Three parts form a volume. The subscription price (which includes postage) of volumes 37 and 38 (1987) is £86.00 net per volume (US \$205.00 in the USA and Canada) for institutions; £44.00 (US \$105.00) per volume for individuals. Single parts cost £30.00 each (US \$72.00 in the USA and Canada) plus postage. All orders must be accompanied by payment.

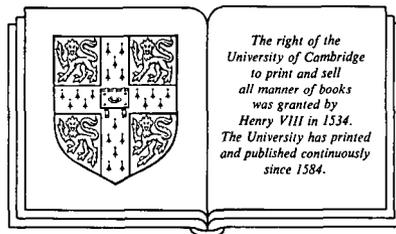
Copies of the journal for subscribers in the United States of America and Canada are sent by air to New York to arrive with minimum delay.

Second class postage paid at New York, NY, and at additional mailing offices. **POSTMASTER**: send address changes in USA and Canada to Cambridge University Press, 32 East 57th Street, New York, NY 10022.

JOURNAL OF PLASMA PHYSICS

VOLUME 37

1987



CAMBRIDGE UNIVERSITY PRESS

Cambridge

New York New Rochelle Melbourne Sydney

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022
10 Stamford Road, Oakleigh, Melbourne 3166, Australia
© Cambridge University Press 1987

Printed in Great Britain by the University Press, Cambridge

CONTENTS TO VOLUME 37

PART 1 FEBRUARY 1987

The orbits of electrons and ions in the fields of the rotamak. W. N. HUGRASS and M. TURLEY	1
Drift instabilities of a relativistic plasma. Part 1. Kinetic description of drift effects in a relativistic plasma. A. B. MIKHAILOVSKII and O. G. ONISHCHENKO	15
Drift instabilities of a relativistic plasma. Part 2. Kinetic theory of low-frequency drift instabilities of a relativistic finite-pressure plasma. A. B. MIKHAILOVSKII and O. G. ONISHCHENKO	29
The ion-ion acoustic instability. S. P. GARY and N. OMIDI	45
Local analysis of extraordinary mode stability properties for relativistic non-neutral electron flow in a planar diode. R. C. DAVIDSON and H. S. UHM	63
Modified convective cells in plasmas. D. JOVANOVIĆ, H. L. PÉCSELI, J. J. RASMUSSEN and K. THOMSEN	81
Self-focusing of nonlinear ion-acoustic waves and solitons in magnetized plasmas. Part 2. Numerical simulations, two-soliton collisions. E. INFELD and P. FRYCZ	97
Nonlinear evolution of a wave packet propagating along a hot magnetoplasma column. B. GHOSH and K. P. DAS	107
Relativistic oblique magnetohydrodynamic shocks. G. M. WEBB, G. P. ZANK and J. F. MCKENZIE	117
Oblique propagation of nonlinear magnetosonic waves. H. A. SHAH and R. BRUNO	143
Thermal effects on parallel-propagating electron cyclotron waves. P. A. ROBINSON	149

PART 2 APRIL 1987

Instability and saturation of drift-convective modes in an inhomogeneous plasma. R. BALESCU, H. BESSENRODT, P. K. SHUKLA and K. H. SPATSCHEK	163
MHD instabilities of a cylindrical plasma with a realistic energy equation. G. TORRICELLI-CIAMPONI, V. CIAMPOLINI and C. CHIUDERI	175
The interaction of a conducting object with a supersonic plasma flow: ion deflection near a negatively charged obstacle. R. L. MERLINO and N. D'ANGELO	185

Convective cell and Alfvén vortices in an inhomogeneous rotating cold magnetoplasma. P. K. SHUKLA and R. BHARUTHRAM	199
An approximate theory of electromagnetic wave propagation in a weakly relativistic plasma. S. S. SAZHIN	209
Almost perpendicular electromagnetic wave transformation in a weakly relativistic inhomogeneous plasma. S. S. SAZHIN	231
The Zakharov equations: a derivation using kinetic theory. D. B. MELROSE	241
Spectrum cascade processes and nonlinear stability in interchange mode turbulence. D. MAJUMDAR	247
Compton and Raman free electron laser stability properties for a warm electron beam propagating through a helical magnetic wiggler. J. A. DAVIES, R. C. DAVIDSON and G. L. JOHNSTON	255
Turbulent relaxation of a confined magnetofluid to a force-free state. J. P. DAHLBURG, D. MONTGOMERY, G. D. DOOLEN and L. TURNER	299
Corrigendum. S. G. TAGARE	322

PART 3 JUNE 1987

A model of an isolated magnetic flux tube in the stratified atmosphere. W. R. HU	323
Particle and energy transport due to magnetic field-line reconnection in a tokamak. S. IZUKA, Y. MINAMITANI and H. TANACA	335
Short-wavelength compressive instabilities in cosmic ray shocks and heat conduction flows. G. P. ZANK and J. F. MCKENZIE	347
The interaction of long-wavelength compressive waves with a cosmic ray shock. G. P. ZANK and J. F. MCKENZIE	363
Two-stream and filamentation instabilities for a light ion beam-plasma system. T. OKADA and W. SCHMIDT	373
Ripple transport in 'transport optimized' stellarators. W. N. G. HITCHON and H. E. MYNICK	383
Transport properties of the two-component strongly coupled plasma. R. CAUBLE and W. ROZMUS	405
The effect of a steady azimuthal field on rotating magnetic field current drive. W. K. BERTRAM	423
Dispersion of electron Bernstein waves including weakly relativistic and electromagnetic effects. Part 1. Ordinary modes. P. A. ROBINSON	435
Dispersion of electron Bernstein waves including weakly relativistic and electromagnetic effects. Part 2. Extraordinary modes. P. A. ROBINSON	449

Contents

vii

A manifestly gauge-invariant Hamiltonian theory of the oscillation-centre dynamics. B. WEYSSOW and R. BALESCU	467
The effect of the ion temperature on the ion acoustic solitary waves in a collisionless relativistic plasma. Y. NEJOH	487
Single-particle motion under the influence of the perpendicular ponderomotive force. M. C. FESTEUAU-BARRIOZ, M. L. SAWLEY and J. VÁCLAVÍK	497
AUTHOR INDEX TO VOLUME 37	507

Continued from back cover

A manifestly gauge-invariant Hamiltonian theory of the oscillation-centre dynamics B. WEYSSOW AND R. BALESCU	467
The effect of the ion temperature on the ion acoustic solitary waves in a collisionless relativistic plasma YASUNORI NEJOH	487
Single-particle motion under the influence of the perpendicular ponderomotive force M. C. FESTEAU-BARRIOZ, M. L. SAWLEY AND J. VÁCLAVÍK	497
AUTHOR INDEX TO VOLUME 37	507

JOURNAL OF PLASMA PHYSICS

Volume 37 Part 3 June 1987

CONTENTS

- A model of an isolated magnetic flux tube in a stratified atmosphere
WEN-RUI HU *page 323*
- Particle and energy transport due to magnetic field-line reconnection in a tokamak
SATORU IIZUKA, YASUJIROH MINAMITANI AND HIROSHI TANACA 335
- Short-wavelength compressive instabilities in cosmic ray shocks and heat conduction flows
G. P. ZANK AND J. F. MCKENZIE 347
- The interaction of long-wavelength compressive waves with a cosmic ray shock
G. P. ZANK AND J. F. MCKENZIE 363
- Two-stream and filamentation instabilities for a light ion beam-plasma system*
TOSHIO OKADA AND WINFRIED SCHMIDT 373
- Ripple transport in 'transport-optimized' stellarators
W. N. G. HITCHON AND H. E. MYNICK 383
- Transport properties of the two-component strongly coupled plasma
R. CAUBLE AND W. ROZMUS 405
- The effect of a steady azimuthal field on rotating magnetic field current drive
W. K. BERTRAM 423
- Dispersion of electron Bernstein waves including weakly relativistic and electromagnetic effects. Part 1. Ordinary modes
P. A. ROBINSON 435
- Dispersion of electron Bernstein waves including weakly relativistic and electromagnetic effects. Part 2. Extraordinary modes
P. A. ROBINSON 449

Continued on inside back cover

© Cambridge University Press 1987

CAMBRIDGE UNIVERSITY PRESS

THE PITT BUILDING, TRUMPINGTON STREET, CAMBRIDGE CB2 1 RP
32 EAST 57TH STREET, NEW YORK, NY 10022, USA
10 STAMFORD ROAD, OAKLEIGH, MELBOURNE 3166, AUSTRALIA

Printed in Great Britain by the University Press, Cambridge