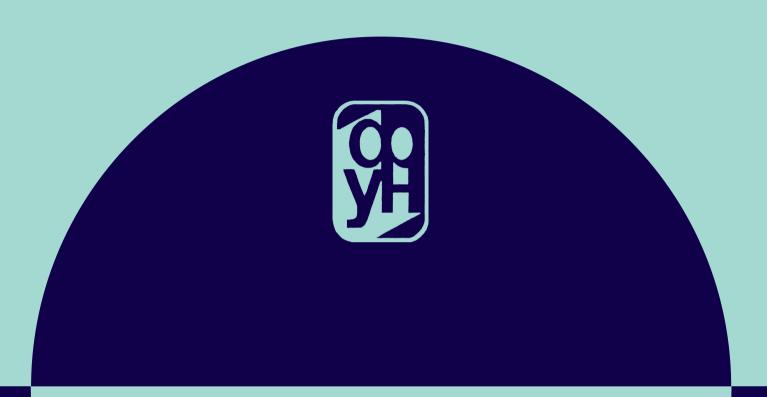
Physics-Uspekhi

Advances in Physical Sciences



July 2010 Volume 53, Number 7

Translation of the Russian journal

Успехи физических наук, Uspekhi Fizicheskikh Nauk

July 2010, Volume 180, No. 7



Turpion

IOP Publishing



ISSN 1063-7869

CODEN: PHUSEY

PHYSICS-USPEKHI

Uspekhi Fizicheskikh Nauk

Editor

LV Keldysh PNLebedev Physical Institute,

Russian Academy of Sciences (RAS), Moscow

First Deputy Editor

VA Rubakov Institute for Nuclear Research, RAS, Moscow

Associate Editors

L P Pitaevskiĭ PL Kapitza Institute for Physical Problems,

RAS, Moscow

OV Rudenko MV Lomonosov Moscow State University,

Managing Editor M S Aksent'eva Uspekhi Fizicheskikh Nauk, RAS, Moscow

Editorial Board

E B Aleksandrov All-Russian Research Center

'SI Vavilov State Optical Institute'

V S Beskin PNLebedev Physical Institute, RAS, Moscow V B Braginskiĭ

MV Lomonosov Moscow State University,

L P Grishchuk PK Shternberg State Astronomical Institute,

Moscow State University, Moscow

YuVGulyaev Institute of Radioengineering and Electronics,

RAS, Moscow

Russian State Research Center SP Denisov

'Institute for High Energy Physics'

I M Dremin PNLebedev Physical Institute, RAS, Moscow GR Ivanitskiĭ Institute of Theoretical and Experimental

Biology, RAS, Pushchino, Moscow Region

A A Kaplyanskiĭ A F Ioffe Physico-Technical Institute,

RAS, St.-Petersburg

GI Budker Institute of Nuclear Physics, G N Kulipanov

RAS, Novosibirsk

PNLebedev Physical Institute, RAS, Moscow EG Maksimov PNLebedev Physical Institute, RAS, Moscow M B Menskii GA Mesyats PNLebedev Physical Institute, RAS, Moscow

LBOkun' Russian State Research Center

Institute of Theoretical and Experimental

Physics', Moscow

V I Ritus PNLebedev Physical Institute, RAS, Moscow M V Sadovskii Institute of Electrophysics, Ural Branch of RAS,

Ekaterinburg

Institute for High Temperatures, RAS, Moscow **BM** Smirnov V E Fortov

Institute for High Energy Density,

RAS, Moscow

Scientific and Staff Editors

MS Aksent'eva, EA Frimer, TP Romanova,

TS Vaĭsberg, EV Zakharova

Uspekhi Fizicheskikh Nauk (Успехи Физических Наук, www.ufn.ru) publishes reviews of the current state of the most topical problems in physics and in associated fields under the general headings: reviews of topical problems, physics of our days, instruments and methods of investigation, methodological notes, from the history of physics, conferences and symposia, personalia, physics news on the Internet, and bibliography. The journal was founded in 1918 and is published monthly.

© 2010 Uspekhi Fizicheskikh Nauk and PN Lebedev Physical Institute of the Russian Academy of Sciences

Physics – Uspekhi

Scientific Editors

MS Aksent'eva, A Radzig, A M Semikhatov

English Language Editor

K Franchuk, M.A., Carleton University, Ottawa, Canada

Desk Editors

AV Bobkov, NV Gribkova, OV Morgunova

Physics-Uspekhi (Advances in Physical Sciences) is the English edition of the Russian monthly journal Uspekhi Fizicheskikh Nauk. Translation into English started with Russian volume 66. From 1958 until 1992 the journal was published by American Institute of Physics under the title Soviet Physics - Uspekhi and in 1993 under its current title Physics - Uspekhi. Since 1994 Physics - Uspekhi has been published jointly by Uspekhi Fizicheskikh Nauk and Turpion Ltd. From the beginning of 1996 *Physics – Uspekhi* is being translated, typeset and edited in Moscow by Uspekhi Fizicheskikh Nauk (UFN). From 2009 published by Uspekhi Fizicheskikh Nauk, Moscow Printed by Page Bros, Norwich, UK.

Institutional subscription information (volume 53, 2010, monthly) For all countries, except the United States, Canada, Central and South America, the subscription rates are: Print + Online (2000 -2010) £ 1505; Print + Online with historic archive (1958–2010) £ 1619; Online only (2000 – 2010) £ 1355; Online only with historic archive (1958 – 2010) £ 1469; Single issue £ 151. Delivery is by airspeeded mail from the UK.

Orders, back issues, change of address to: Physics-Uspekhi, Journals Subscription Fulfilment, Institute of Physics Publishing, Dirac House, Temple Back, Bristol BS16BE, United Kingdom

For the United States, Canada, Central and South America, the subscription rates are:

Print + Online (2000 – 2010) US \$2709; Print + Online with historic

archive (1958 – 2010) US \$ 2915; Online only (2000 – 2010)

US \$ 2438; Online only with historic archive (1958 – 2010) US \$ 2644; Single issue US \$ 271. Delivery is by transatlantic airfreight and onward mailing. United States Postal Identification Statement Physics - Uspekhi, volume 53, published monthly. Periodicals Postage Pending at Huntington Station, NY and at additional mailing offices.

POSTMASTER: Send orders, address changes to *Physics – Uspekhi*, American Institute of Physics, Suite 1NO1, 2 Huntington

Quadrangle, Melville, NY 11747-4502, USA.

Online services: Since 2008 electronic access to the journal content is hosted by IOP Publishing. The electronic version of the journal is available at http://www.iop.org/journals/phu. All questions regarding online access should be sent to customer services at custserv@iop.org or custserv@turpion.ru

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form, or by any means, electronic, mechanical, photographic, recording, or otherwise, without the prior permission of Uspekhi Fizicheskikh Nauk.

Leninskiĭ prospekt 15,119071 Moscow, Russian Federation Tel. (7-499) 132 62 65, (7-499) 132 63 48, (7-499) 190 34 52 Tel./Fax (7-499) 190 42 44. E-mail: ufn@ufn.ru

© 2010 Uspekhi Fizicheskikh Nauk and PN Lebedev Physical Institute of the Russian Academy of Sciences

Contents

Near-surface quantum states of neutrons in the gravitational and centrifugal potentials V V Nesvizhevsky	645
Surface spin-flop transition in an antiferromagnet A I Morosov, A S Sigov	677
Physical conditions in potential accelerators of ultra-high-energy cosmic rays: updated Hillas plot and radiation-loss constraints K V Ptitsyna, S V Troitskii	691
Demonstration of nonlinear wave phenomena in the plasma of a laboratory model of an ionospheric-magnetospheric density duct G A Markov, A S Belov	703
On the importance of the Born-Oppenheimer approximation in intramolecular dynamics A V Burenin	713
Spintronics (Scientific session of the Physical Sciences Division of the Russian Academy of Sciences, 3 February 2010): contribution by Yu G Kusrayev; S A Tarasenko; N S Averkiev	725
In memory of Aleksei Norairovich Sissakian	747
New books on physics and related sciences E V Zakharova	749
Physics news on the Internet Yu N Eroshenko	753
\diamond \diamond \diamond	

In the next issue

Diamagnetic (Condon) domains V S Egorov

Current trends in the physics of thermoelectric materials A V Dmitriev, I P Zvyagin

Charge spectrum of galactic cosmic ray nuclei

as measured in meteorite olivines

A B Aleksandrov, A V Bagulya, M S Vladimirov, L A Goncharova, A I Ivliev, G V Kalinina, L L Kashkarov, N S Konovalova,

N M Okat'eva, N G Polukhina, A S Rusetskii, N I Starkov

Tsunami wave suppression using submarine barriers

A M Fridman, L S Alperovich, L Shemer, L Pustil'nik,

D Shtivelman, An G Marchuk, D Liberzon

On dual representation in classical electrodynamics

D V Karlovets

Birds and frogs in mathematics and physics F Dyson

V A Fock and gauge symmetry

L B Okun

On the invariant form of the wave and motion equations for a charged point-mass

V A Fock

Conferences and symposia

Personalia

Physics news on the Internet



1063-7869(2010)53:7:1-0