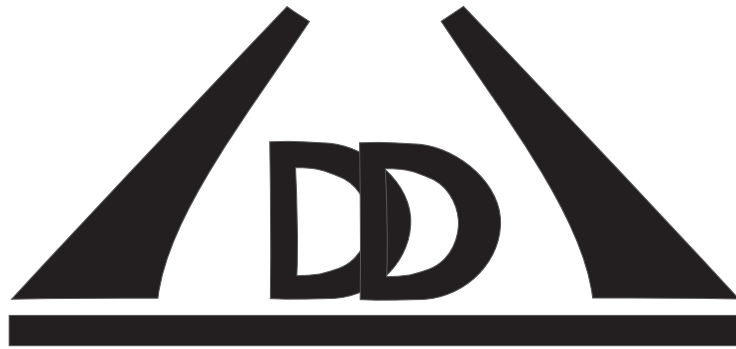


Proceedings of the International Conference



DAYS on DIFFRACTION 2014

May 26 – 30, 2014
St. Petersburg, Russia

Proceedings of the International Conference “Days on Diffraction 2014”, St. Petersburg, Russia

Edited by **O.V. Motygin** (Institute of Problems in Mechanical Engineering, St. Petersburg)
A.P. Kiselev (St. Petersburg Department of V. A. Steklov Mathematical Institute)
L.I. Goray (St. Petersburg Academic University & Institute for Analytical Instrumentation)
A. Ya. Kazakov (St. Petersburg University of Aerospace Instrumentation)
A.S. Kirpichnikova (Liverpool Hope University)

“Days on Diffraction” is an annual conference taking place in May–June in St. Petersburg since 1968. The present event is organized by St. Petersburg Department of the Steklov Mathematical Institute, St. Petersburg State University, Euler International Mathematical Institute and ITMO University.

About 170 scientists came from different parts of the world to participate in “Days on Diffraction 2014”; the Organizing Committee thanks them all. Of special gratitude are the authors of extended abstracts submitted to the Proceedings; 45 of them (selected by peer-review) are published in the present issue.

Organizing committee: V. M. Babich /Chair/, A. S. Kirpichnikova /Secretary/,
T. V. Vinogradova /Visas/, N. V. Zalesskaya /Accommodation/, I. V. Andronov,
P. A. Belov, N. Ya. Kirpichnikova, A. P. Kiselev, M. A. Lyalinov, O. V. Motygin,
M. V. Perel, A. M. Samsonov, V. P. Smyshlyaev, R. Stone, V. N. Troyan, N. Zhu

Web site of the conference: <http://www.pdmi.ras.ru/~dd/>

The conference is organized and sponsored by



St. Petersburg Department
of V.A. Steklov
Institute of Mathematics



St. Petersburg State
University



The Euler International
Mathematical Institute



ITMO University



Russian Foundation
for Basic Research



IEEE Russia (Northwest)
Section AP/ED/MTT
Joint Chapter



Russian Academy of
Sciences

IEEE Catalog No.:

CFP14489-ART (Electronic media)
CFP14489-PRT (Print)

ISBN:

978-1-4799-6699-8 (Electronic)
978-1-4799-7331-6 (Print)

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For reprint or republication permission, email to IEEE Copyrights Manager at pubs-permissions@ieee.org. All rights reserved. Copyright © 2014 by IEEE.

CONTENTS

Eron L. Aero, Anatolii N. Bulygin, Yurii V. Pavlov	
Nonlinear theory of localized and periodic waves in solid crystal media with complex lattice	6
Irina L. Alexandrova	
GPU-based calculations in electromagnetic wave diffraction problems	12
Anatoly Anikin, Michel Rouleux	
Multidimensional tunneling between potential wells at non degenerate minima	17
A.V. Anufrieva, D.N. Tumakov	
On some of the peculiarities of propagation of an elastic wave through a gradient transversely isotropic layer	23
L.M. Baskin, M.M. Kabardov, N.M. Sharkova	
Electron multichannel scattering by narrows of quantum waveguides	29
L.M. Baskin, M.M. Kabardov, N.M. Sharkova	
Fano resonances in the process of multichannel scattering in quantum waveguides with narrows	33
Yuriy N. Belyayev	
Transfer matrix of the sixth order	37
Yakov L. Bogomolov, Maxim A. Borodov, Alexei D. Yunakovsky	
Scattering of electromagnetic waves in a plane channel with sharp corners	43
V.V. Borzov, E.V. Damaskinsky	
On dimensions of oscillator algebras	48
Maria A. Buzova	
Comparison of different current-based hybrid methods for analysis of electromagnetic waves diffraction by finite thickness large scatterers	53
Currò C., Fusco D., Manganaro N.	
Nonlinear wave interactions in multicomponents chromatography	59
E.D. Derevyanchuk, Yu.G. Smirnov	
Tensor permittivity reconstruction of two-sectional diaphragm in a rectangular waveguide	65
Dreiden G.V., Samsonov A.M., Semenova I.V., Shvartz A.G.	
Bulk strain solitons in a cylindrical shell	69
Plamen P. Fiziev	
Novel representation of the general Heun's functions. Back to the beginning	76
Glushkov E.V., Glushkova N.V., Fomenko S.I.	
Source energy distribution and successive forwarding in layered and functionally graded elastic substructures	80
Golub M.V., Fomenko S.I., Alexandrov A.A.	
Simulation of plane 3D wave propagation in layered piezoelectric phononic crystals	83
Leonid I. Goray, Paul N. Racec	
Boundary conditions effect on states and transitions in a quantum-well – nanobridge – quantum dot structure	89
Maxim A. Gorchak, Alexander N. Poddubny, Pavel A. Belov	
Microscopic model of the self-induced torque in metamaterials	96

Elena F. Grekova	
On one class of theoretically constructed isotropic single negative continuous acoustic metamaterials	101
Vladimir A. Gusev	
Nonlinear acoustic wave propagation in the waveguide formed by the bottom bubble layer	107
Timur Z. Ismagilov	
Second order finite volume scheme on structured meshes for Maxwell's equations with discontinuous dielectric permittivity	113
Karchevskii E.M., Spiridonov A.O.	
An inverse eigenvalue problem of the theory of optical waveguides	118
N.Ya. Kirpichnikova, M.M. Popov	
Diffraction by strongly elongated bodies and matching of the asymptotics in illuminated part of the light-shadow boundary	124
Kleev A.I., Kyurkchan A.G.	
Using the spheroidal coordinates for solving the diffraction problems by pattern equation method	128
Yaroslav Y. Kononov, Oleg V. Kravchenko	
Application of new family of atomic functions $ch_{a,n}$ to solution of boundary value problems	132
Dmitrii V. Korikov	
Asymptotics of solutions to wave equation in domain with a small hole	138
Sergey B. Kozitskiy, Mikhail Yu. Trofimov, Alena D. Zakharenko	
Modeling of structures in 3D double-diffusive convection	144
Alexander Krasnok, Pavel Belov, Alex Maloshtan, Dmitry Chigrin	
All-dielectric nanoantenna for single NV center radiation collection enhancement	150
A.E. Krasnok, A.P. Slobozhanyuk, P.A. Belov, A.N. Poddubny	
Experimental investigation of magnetic Purcell factor in wire metamaterials	156
I.P. Krasnov	
Description of electromagnetic processes in a matter in relativistic invariant form	162
Victor F. Kravchenko, Oleg V. Kravchenko, Dmitry V. Churikov	
Analytic Kravchenko–Kaiser wavelets and their physical properties	168
Alexander V. Kudrin, Anna S. Zaitseva, Tatyana M. Zaboronkova	
Comparison of integral equation and transmission line methods for analysis of a loop antenna located on the surface of an axially magnetized plasma column	172
Kurseeva V.Yu., Valovik D.V.	
Propagation of TE waves in a plane dielectric waveguide with nonlinear permittivity	177
E.A. Marennikova, Yu.G. Smirnov, D.V. Valovik	
Coupled electromagnetic TE-TE waves propagation. Numerical approach to determine coupled propagation constants	181
Petrov P.S.	
A method for single-hydrophone geoacoustic inversion based on the modal group velocities estimation: application to a waveguide with inhomogeneous bottom relief	186
Alexei Popov, Igor Prokopovich, Vladimir Kopeikin, Dmitry Edemskii	
Synthetic aperture approach to microwave holographic image improvement	192

Ilya A. Shereshevskiy, Aleksandr M. Klushin, Vladislav V. Kurin, Nadezda K. Vdovicheva Simulation of Josephson antenna array in two dimensional electrodynamic waveguide	198
Smolkin E.Yu. Propagation of TE waves in a double-layer nonlinear inhomogeneous cylindrical waveguide	204
Spiridonov A.O., Karchevskii E.M. Parallel computing for numerical calculations of step-index optical fibers eigenmodes by collocation method	209
Ivan Starkov, Zbyněk Raida, Alexander Starkov Diffraction of electromagnetic wave on skin capillary	215
Ivan Starkov, Alexander Starkov Green's function asymptotic in periodic medium	220
Yakov M. Strelniker, David J. Bergman, Anna O. Voznesenskaya Strong angular anisotropy of Voigt effect and other magneto-optical phenomena in ordered metal-dielectric metamaterials	224
Mikhail Yu. Trofimov, Sergey B. Kozitskiy, Alena D. Zakharenko Acoustic mode equations with resonant mode interaction	230
Andrei B. Utkin Wave booms originated from fast line sources	235
Arthur D. Yaghjian Generalized Clausius–Mossotti homogenization for the permittivity of an electric quadrupolar medium	240
Author index	247