Proceedings of the International Conference



DAYS on DIFFRACTION 2022

May 30-June 3, 2022

St. Petersburg, Russia

Proceedings of the International Conference "Days on Diffraction 2022", St. Petersburg, Russia

Edited by O.V. Motygin (Institute for Problems in Mechanical Engineering, St. Petersburg)

A.P. Kiselev (St. Petersburg Department of V. A. Steklov Mathematical Institute)

L.I. Goray (Alferov University & Institute for Analytical Instrumentation)

T.M. Zaboronkova (University of Nizhny Novgorod)

"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, and the Euler International Mathematical Institute.

The conference is supported by a grant from the Government of the Russian Federation, agreement N_0 075-15-2022-289, and by Simons Foundation.

The Organizing Committee thanks all scientists from different parts of the world who participated in the on-line conference "Days on Diffraction 2022". Of special gratitude are the authors of extended abstracts submitted to the Proceedings; 26 of the papers (selected by peer-review) are published in the present issue.

Organizing committee: V.M. Babich /Chair/, M.I. Belishev /Vice-chairman/, I.V. Andronov, L.I. Goray, N.Ya. Kirpichnikova, A.P. Kiselev, M.A. Lyalinov, V.S. Mikhaylov, O.V. Motygin, M.V. Perel, V.P. Smyshlyaev, R. Stone, N. Zhu, E.A. Zlobina

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



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





IEEE Catalog No.: CFP22489-ART

ISBN:

979-8-3503-4546-9

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 © 2022 by IEEE.

Contents

E.V. Barshak, B.P. Lapin, D.V. Vikulin, C.N. Alexeyev, M.A. Yavorsky Transformation of angular momentum of light in a system of anisotropic and multihelical optical fibers
Eva V. Bazhilova, Alexander V. Kudrin, Tatyana M. Zaboronkova, Anna S. Zaitseva Electrodynamic characteristics of a multigap loop antenna with phased excitation in a magneto- plasma
M.N. Demchenko On the equivalence of the BMO-norm of divergence-free vector fields and norm of related paracommutators
Dolinina, D.A., Yulin, A.V. Spontaneous symmetry breaking in a waveguide with periodic complex potential
Ruslan M. Feshchenko, Alexei V. Popov Exact transparent boundary conditions for the 2D Helmholtz equation
Evgeny V. Glushkov, Natalia V. Glushkova, Olga A. Ermolenko, Alexey M. Tatarinov Extracting guided wave characteristics of bone phantoms from ultrasonometric data for osteo- porosis diagnosis
Mikhail V. Golub, Olga V. Doroshenko, Sergey I. Fomenko, Viktor V. Kozhevnikov, Yanzheng Wang, Chuanzeng Zhang Wave excitation in laminates by a piezoelectric transducer with intermediate layered acoustic metamaterials with periodic arrays of cracks
Leonid I. Goray Diffraction on non-plane gratings irradiated by non-planar waves
Leonid I. Goray, Alexander S. Dashkov, Nikita A. Kostromin Inverse diffraction grating problems as optimization tasks: from naïve to Bayes approach
Vladimir A. Gusev Calculation of the field of a high-intensity focused ultrasonic beam using the modular nonlinearity model
Alexey V. Ivanov On hyperbolicity of close to piecewise constant linear cocycles over irrational rotations
Alexander V. Ivoninsky, Alexander V. Kudrin, Tatyana M. Zaboronkova Resonance scattering of an extraordinary wave by a smoothed-walled duct with decreased density in a magnetoplasma
E. Korotyaev, N. Saburova Estimates of total bandwidth for magnetic Schrödinger operators on periodic graphs
Andrey Kovtanyuk, Alexander Chebotarev, Tim Seleznev, Renée Lampe Cerebral oxygen transport model with unknown surface sources
Peter G. Malischewsky Diabolical points and Rayleigh-wave propagation 88

Maslovskaya, A.G., Moroz, L.I. Computational techniques for time-fractional modeling of thermal wave propagation in ferro- electrics	. 95
Alexander S. Mikhaylov, Victor S. Mikhaylov On a special Hilbert space of functions associated with the multidimensional wave equation in a bounded domain	101
Nikolai Park, Alexander Chebotarev, Andrey Kovtanyuk Boundary optimal control of radiative-conductive heat transfer with reflection and refraction effects	106
Ivan A. Pavlichenko Plasmon resonances of spherical semiconductor-metal core-shell nanostructure	111
Maria V. Perel Asymptotic analysis of tunneling through potential barrier in graphene placed in a magnetic field	116
Vera M. Petnikova, Vladimir A. Makarov The role of Airy beam parameters in the optical manipulation problems	120
Sergey Yu. Sadov, Gleb V. Kalachev On maximizers of convolution operators in $L_p(\mathbb{R}^n)$	125
Turichina, D.G., Farafonov, V.G., Il'in, V.B. Exact solution to the light scattering problem for a core-mantle spheroid with non-confocal layer boundaries	130
Zalipaev, V., Leibov, L., Ismagilov, A., Nasedkin, B., Petrov, N., Tcypkin, A. Computational aspects of ghost imaging diffraction in broadband terahertz range	136
Zalipaev, V., Shumigai, V., Zalialiutdinov, T., Dubrovich, V. Dynamics and radiation effects for charges propagating in ultraintense laser fields	142
Ekaterina A. Zlobina, Aleksei P. Kiselev Detailed study of the Malyuzhinets – Popov diffraction problem	149
Author index	153