Recent Titles in This Series

162  S. G. Gindikin, Editor, Applied Problems of Radon Transform
161  Katsum Nomizu, Editor, Selected Papers on Analysis, Probability, and Statistics
160  Katsum Nomizu, Editor, Selected Papers on Number Theory, Algebraic Geometry, and Differential Geometry
159  O. A. Ladyzhenskaya, Editor, Proceedings of the St. Petersburg Mathematical Society, Volume II
157  M. Sh. Birman, Editor, Wave Propagation. Scattering Theory
156  V. N. Gerasimov, N. G. Nesterenko, and A. I. Valitkas, Three Papers on Algebras and Their Representations
154  V. A. Artamonov et al., Selected Papers in K-Theory
153  S. G. Gindikin, Editor, Singularity Theory and Some Problems of Functional Analysis
152  H. Draškovičová et al., Ordered Sets and Lattices II
150  S. G. Gindikin, Editor, Spectral Theory of Operators
149  V. S. Afraimovich et al., Thirteen Papers in Algebra, Functional Analysis, Topology, and Probability, Translated from the Russian
147  I. G. Bashmakova et al., Nine Papers from the International Congress of Mathematicians, 1986
146  L. A. Aizenberg et al., Fifteen Papers in Complex Analysis
145  S. G. Dalalyan et al., Eight Papers Translated from the Russian
144  S. D. Berman et al., Thirteen Papers Translated from the Russian
143  V. A. Belonogov et al., Eight Papers Translated from the Russian
142  M. B. Abalovich et al., Ten Papers Translated from the Russian
141  H. Draškovičová et al., Ordered Sets and Lattices
140  V. I. Bernik et al., Eleven Papers Translated from the Russian
139  A. Ya. Aizenshtat et al., Nineteen Papers on Algebraic Semigroups
138  I. V. Kovalishina and V. P. Potapov, Seven Papers Translated from the Russian
137  V. I. Arnol’d et al., Fourteen Papers Translated from the Russian
136  L. A. Aksen’ev et al., Fourteen Papers Translated from the Russian
135  S. N. Artemov et al., Six Papers in Logic
134  A. Ya. Aizenshtat et al., Fourteen Papers Translated from the Russian
133  R. R. Sunchelev et al., Thirteen Papers in Analysis
132  I. G. Dmitriev et al., Thirteen Papers in Algebra
131  V. A. Zmorovich et al., Ten Papers in Analysis
130  M. M. Lavrent’ev, K. G. Reznitskaya, and V. G. Yakhno, One-dimensional Inverse Problems of Mathematical Physics
129  S. Ya. Khavinson, Two Papers on Extremal Problems in Complex Analysis
128  I. K. Zhuk et al., Thirteen Papers in Algebra and Number Theory
127  P. L. Shabalin et al., Eleven Papers in Analysis
126  S. A. Akhmedov et al., Eleven Papers on Differential Equations
125  D. V. Anosov et al., Seven Papers in Applied Mathematics
124  B. P. Allakhverdiev et al., Fifteen Papers on Functional Analysis
123  V. G. Maz’ya et al., Elliptic Boundary Value Problems

(Continued in the back of this publication)
This page intentionally left blank
Applied Problems of Radon Transform
Applied Problems of Radon Transform

Simon Gindikin
Editor
C. G. Гиндинkin (редактор)

Приложения преобразования Радона

Translated from an original Russian manuscript by D. DEART
Translation edited by SIMEON IVANOV

ABSTRACT. The aim of this collection is to acquaint the reader with recent work in this area that was done in what was formerly the Soviet Union. The papers in this collection are devoted to mathematical problems that are related to applications. In some cases these problems are problems of practical tomography; in other cases they are theoretical problems that originated in tomography. However, in all these papers the main emphasis is on the mathematical aspects of the problem.

1991 Mathematics Subject Classification. Primary 44–02, 44A12, 65R10, 92C55

Library of Congress Cataloging-in-Publication Data
Includes bibliographical references.
ISBN 0-8218-7508-6 (acid-free paper)
QA3.A572 ser. 2 vol. 162
[RC78.7.T6]
510 s—dc20
[616.0757’0151] 94-27251 CIP

Copying and reprinting. Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication (including abstracts) is permitted only under license from the American Mathematical Society. Requests for such permission should be addressed to the Manager of Editorial Services, American Mathematical Society, P.O. Box 6248, Providence, Rhode Island 02940-6248. Requests can also be made by e-mail to reprint-permission@math.ams.org.

The appearance of the code on the first page of an article in this publication (including abstracts) indicates the copyright owner's consent for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law, provided that the fee of $1.00 plus $.25 per page for each copy be paid directly to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, Massachusetts 01923. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale.

© Copyright 1994 by the American Mathematical Society. All rights reserved.

Printed in the United States of America.

The American Mathematical Society retains all rights except those granted to the United States Government.

The paper used in this book is acid-free and falls within the guidelines established to ensure permanence and durability.

Printed on recycled paper.

This volume was typeset using \textit{AMSL-TEX},
the American Mathematical Society’s \TeX macro system.

10 9 8 7 6 5 4 3 2 1 98 97 96 95 94
Contents

Time Series Analysis and Grassmannians
V. M. Buchstaber  
1

Inversion of the Generalized Radon Transform
A. S. Denisyuk  
19

Generalized Projection and Section Theorems in Diffraction Tomography
A. N. Panchenko  
33

Computation of Singular Convolutions
D. A. Popov and D. V. Sushko  
43

Mathematical Models in Two-dimensional Radon Tomography
D. A. Popov, E. B. Sokolova, and D. V. Sushko  
129

Mathematical Aspects of Polarization Tomography
V. A. Sharafutdinov  
205

Exponential Radon Transform
I. Ya. Shnirelberg  
235

On a New Reconstruction Algorithm in Emission Tomography
I. Ya. Shnirelberg, I. V. Ponomarev, V. A Dmitrichenko, and S. D. Kalashnikov  
247

Examples of Nonuniqueness in Problems Related to the Generalized Radon Transform and Emission Tomography with Absorption
L. Vertgeim  
257
This page intentionally left blank
This page intentionally left blank
Recent Titles in This Series

122 N. U. Arakelyan et al., Ten Papers on Complex Analysis
121 V. D. Mazurov, Yu. I. Merzlyakov, and V. A. Churkin, Editors, The Kourovka Notebook: Unsolved Problems in Group Theory
120 M. G. Kreǐn and V. A. Jakubovič, Four Papers on Ordinary Differential Equations
119 V. A. Dem′janenko et al., Twelve Papers in Algebra
118 Ju. V. Egorov et al., Sixteen Papers on Differential Equations
117 S. V. Bočkarev et al., Eight Lectures Delivered at the International Congress of Mathematicians in Helsinki, 1978
116 A. G. Kuśnirenko, A. B. Katok, and V. M. Alekseev, Three Papers on Dynamical Systems
115 I. S. Belov et al., Twelve Papers in Analysis
114 M. Š. Birman and M. Z. Solomjak, Quantitative Analysis in Sobolev Imbedding Theorems and Applications to Spectral Theory
113 A. F. Lavrik et al., Twelve Papers in Logic and Algebra
112 D. A. Gudkov and G. A. Utkin, Nine Papers on Hilbert’s 16th Problem
111 V. M. Adamjan et al., Nine Papers on Analysis
110 M. S. Budjanu et al., Nine Papers on Analysis
109 D. V. Anosov et al., Twenty Lectures Delivered at the International Congress of Mathematicians in Vancouver, 1974
108 Ja. L. Geronimus and Gábor Szegő, Two Papers on Special Functions
107 A. P. Misina and L. A. Škornjakov, Abelian Groups and Modules
106 M. Ja. Antonovskii, V. G. Boltjanskii, and T. A. Sarymsakov, Topological Semifields and Their Applications to General Topology
105 R. A. Aleksandryan et al., Partial Differential Equations, Proceedings of a Symposium Dedicated to Academician S. L. Sobolev
104 L. V. Ahlfors et al., Some Problems on Mathematics and Mechanics, On the Occasion of the Seventieth Birthday of Academician M. A. Lavrent′ev
103 M. S. Brodskii et al., Nine Papers in Analysis
102 M. S. Budjanu et al., Ten Papers in Analysis
101 B. M. Levitan, V. A. Marčenko, and B. L. Roždestvenskii, Six Papers in Analysis
100 G. S. Cećtin et al., Fourteen Papers on Logic, Geometry, Topology and Algebra
99 G. S. Cećtin et al., Five Papers on Logic and Foundations
98 G. S. Cećtin et al., Five Papers on Logic and Foundations
97 B. M. Budak et al., Eleven Papers on Logic, Algebra, Analysis and Topology
96 N. D. Filippov et al., Ten Papers on Algebra and Functional Analysis
95 V. M. Adamjan et al., Eleven Papers in Analysis
94 V. A. Baranskii et al., Sixteen Papers on Logic and Algebra
93 Ju. M. Berezanskii et al., Nine Papers on Functional Analysis
92 A. M. Ančikov et al., Seventeen Papers on Topology and Differential Geometry
91 L. I. Barklon et al., Eighteen Papers on Analysis and Quantum Mechanics
90 Z. S. Agranovič et al., Thirteen Papers on Functional Analysis
89 V. M. Alekseev et al., Thirteen Papers on Differential Equations
88 I. I. Eremin et al., Twelve Papers on Real and Complex Function Theory
87 M. A. Azerman et al., Sixteen Papers on Differential and Difference Equations, Functional Analysis, Games and Control
86 N. I. Ahiezer et al., Fifteen Papers on Real and Complex Functions, Series, Differential and Integral Equations
85 V. T. Fomenko et al., Twelve Papers on Functional Analysis and Geometry

(See the AMS catalog for earlier titles)