ISSN 1881-6193

RIMS Kôkyûroku Bessatsu B52

Exponential Analysis of Differential Equations and Related Topics

edited by Yoshitsugu Takei

November, 2014
Research Institute for Mathematical Sciences
Kyoto University

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October 15～18, 2013

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Preface

To activate researches in the fields of microlocal analysis and asymptotic analysis, we organized the RIMS Conference

"Exponential Analysis of Differential Equations and Related Topics"

at the Research Institute for Mathematical Sciences, Kyoto University from October 15 (Tuesday) through October 18 (Friday) in 2013. This volume of RIMS Kôkyûroku Bessatsu is a collection of research papers, announcements and survey articles contributed by invited speakers of the above conference. All papers in the volume have been reviewed and are in their final forms.

The conference was planned also to celebrate the sixtieth birthday of Professor Takashi AOKI. As is shown by the fact that many papers contained in this volume are dedicated to him, Prof. Aoki has been contributing to the developments of microlocal analysis and asymptotic analysis, and stimulating many researchers in these fields. For example, he established the so-called exponential calculus of microdifferential operators of infinite order in the field of microlocal analysis and, by using computers in an effective manner, showed the importance of the geometry of Stokes curves in the exact WKB analysis. In fact, many impressive figures of Stokes curves he wrote have brought substantial progress of exact WKB analysis. Taking this opportunity, we would like to express our deep respect and sincere gratitude to Prof. Aoki for his great efforts and achievements in these fields.

The conference was supported by RIMS. We express our heartiest thanks to the secretary staff of RIMS for their kind assistance.

Kyoto in October, 2014

Yoshitsugu TAKEI
(Organizer in chief)
RIMS, Kyoto University

Program

Exponential Analysis of Differential Equations and Related Topics

October 15 (Tue) – October 18 (Fri), 2013
Lecture Hall (Room No. 420) of RIMS, Kyoto University

October 15, Tuesday

10:00 – 11:00 D. C. Struppa (Chapman Univ., USA)
Propagation of superoscillations as solutions to the Cauchy problem for generalized Schrödinger equations

11:15 – 12:15 N. Honda (Hokkaido Univ.) and T. Kawai (RIMS, Kyoto Univ.)
Sato's postulates on the S-matrix revisited through the Borel resummation of the perturbation series (a joint work with Henry P. Stapp)

14:00 – 15:00 R. Schäfke (Strasbourg, France)
Loray's reduction of a vector field with nilpotent linear part and polynomial asymptotics

15:15 – 16:15 T. Koike (Kobe Univ.)
On the computation of Voros coefficients via middle convolutions (joint work with K. Iwaki)

16:30 – 17:10 M. Tanda (Kinki Univ.)
Parametric Stokes phenomena of the Gauss hypergeometric differential equation with a large parameter (joint work with T. Aoki)

17:20 – 18:00 T. Takahashi (Kinki Univ.)
On the WKB theoretic structure of a Schrödinger operator with a Stokes curve of loop type

October 16, Wednesday

10:00 – 11:00 Y. Matsui (Kinki Univ.)
Topological Radon transforms and their applications

11:15 – 12:15 A. Sebbar (Bordeaux, France)
Folding paper, theta function and eta function

14:00 – 15:00 S. Kamimoto (RIMS, Kyoto Univ.), T. Kawai (RIMS, Kyoto Univ.) and T. Koike (Kobe Univ.)
A happy marriage of resurgent functions and linear differential operators of infinite order in exact WKB analysis

15:15 – 16:15 A. Voros (Saclay, France)
Zeta functions over zeros of zeta functions, and an exponential-asymptotic view of the Riemann Hypothesis

16:30 – 17:30 T. Aoki (Kinki Univ.)
Exact WKB analysis of confluent hypergeometric equations (joint work with T. Takahashi and M. Tanda)

October 17, Thursday

10:00 – 11:00 Y. Ohyama (Osaka Univ.)
The q-Painlevé equations and Riemann-Hilbert-Birkhoff problem

11:15 – 12:15 S. Malek (Lille, France)
On Gevrey asymptotics for difference-differential nonlinear PDE

14:00 – 15:00 S. Tajima (Univ. of Tsukuba)
b-functions and algebraic local cohomology classes attached to Lê cycles

15:15 – 16:15 S. Yamazaki (Nihon Univ.)
Kernel functions and symbols of pseudodifferential operators of infinite order with an apparent parameter (joint work with T. Aoki and N. Honda)

16:30 – 17:10 K. Umeta (Hokkaido Univ.)
On the sheaf of Laplace hyperfunctions in several variables (joint work with Naofumi Honda)

17:20 – 18:00 D. Tarama (Kyoto Univ.)
Analytic extension of Birkhoff normal forms for Hamiltonian systems of one degree of freedom

October 18, Friday

10:00 – 11:00 G. Lysik (Polish Academy of Sciences, Poland)
Summability of formal solutions to partial differential equations

11:15 – 12:15 M. Yoshino (Hiroshima Univ.)
Connection problem for non integrable Hamiltonian system

14:00 – 15:00 A. Shudo (Tokyo Metropolitan Univ.)
Toward pruning theory of the Stokes geometry for the quantum Henon map

15:15 – 16:15 Y. Umeta (Tokyo Univ. of Science)
Instanton-type solutions of Painlevé hierarchies $(P_J)_m$ $(J = \mathrm{I}, \mathrm{II}, 34, \mathrm{IV})$

16:30 – 17:30 Y. Takei (RIMS, Kyoto Univ.)
The fourth-order PI equation and coalescing phenomena of nonlinear turning points

List of Participants

Kana Ando	Chiba University
Takashi Aoki	Kinki University
Yasuo Chiba	Tokyo University of Technology
Setsuro Fujiié	Ritsumeikan University
Keiko Fujita	Toyama University
Yuichi Ike	University of Tokyo
Ryuichi Ishimura	Chiba University
Kohei Iwaki	RIMS, Kyoto University
Shingo Kamimoto	RIMS, Kyoto University
Akira Kaneko	Ochanomizu University
Kazuo Kaneko	Seki Kowa Institute of Mathematics
Kiyoomi Kataoka	University of Tokyo
Takahiro Kawai	RIMS, Kyoto University
Tatsuya Koike	Kobe University
Masahiro Kubo	Nagoya Institute of Technology
Naoto Kumanogo	Kogakuin University
Grzegorz Łysik	Polish Academy of Sciences
Stephane Malek	Université de Lille 1
Fumitsuna Maruyama	Keio University
Yutaka Matsui	Kinki University
Shinya Moritoh	Nara Women's University
Takahiro Moteki	RIMS, Kyoto University
Yasuyuki Nagatomo	Meiji University
Hajime Nagoya	Rikkyo University
Tomoki Nakanishi	Nagoya University
Yasuo Ohno	Kinki University
Yousuke Ohyama	Osaka University
Yasunori Okada	Chiba University

Shinji Sasaki	RIMS, Kyoto University
Reinhard Schäfke	IRMA, Université de Strasbourg
Ahmed Sebbar	Université de Bordeaux I
Akira Shirai	Sugiyama Jogakuen University
Akira Shudo	Tokyo Metropolitan University
Daniele C. Struppa	Chapman University
Hidetoshi Tahara	Sophia University
Shinichi Tajima	University of Tsukuba
Toshinori Takahashi	Kinki University
Yoshitsugu Takei	RIMS, Kyoto University
Mika Tanda	Kinki University
Daisuke Tarama	Kyoto University
Kouichi Toda	Toyama Prefectural University
Motoo Uchida	Osaka University
Koichi Uchiyama	Sophia University
Kohei Umeta	Hokkaido University
Yoko Umeta	Tokyo University of Science
André Voros	CEA Saclay
Seiichiro Wakabayashi	University of Tsukuba
Takuya Watanabe	Ritsumeikan University
Hideshi Yamane	Kwansei Gakuin University
Susumu Yamazaki	Nihon University
Hiroshi Yamazawa	Shibaura Institute of Technology
Kunio Yoshino	Tokyo City University
Masafumi Yoshino	Hiroshima University

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