ISSN 1881-6193

RIMS Kôkyûroku Bessatsu B40

Recent development of micro-local analysis for the theory of asymptotic analysis

edited by Naofumi Honda, Yasunori Okada and Motoo Uchida

April, 2013
Research Institute for Mathematical Sciences
Kyoto University

RIMS Kôkyûroku Bessatsu B40

Recent development of micro-local analysis for the theory of asymptotic analysis

November 15～18, 2011

edited by Naofumi Honda, Yasunori Okada and Motoo Uchida

April, 2013

Research Institute for Mathematical Sciences

Kyoto University, Kyoto, Japan

The papers presented in this volume of RIMS Kôkyûroku Bessatsu are in final form and refereed.
ⓒ2013 by the Research Institute for Mathematical Sciences, Kyoto University. All rights reserved.
Printed in Japan.

Preface

This volume presents a collection of research and survey articles which were contributed by invited speakers in the RIMS workshop " Recent development of micro-local analysis for the theory of asymptotic analysis " held at Research Institute for Mathematical Sciences (RIMS), Kyoto University from 15 through 18 November, 2011, in which experts from many areas of mathematics participated.

Naofumi Honda

Yasunori Okada

Motoo Uchida

Program

RIMS Workshop on

Recent development of micro-local analysis for the theory of asymptotic analysis

Organizers: Naofumi Honda (Hokkaido Univ.),
Yasunori Okada (Chiba Univ.) and Motoo Uchida (Osaka Univ.)

November 15 (Tue.)–18 (Fri.), 2011, Room No. 110 of RIMS, Kyoto University

November 15, Tuesday

10:00 - 11:00 Yasunori Okada (Chiba Univ.)
Massera type theorems in hyperfunctions with reflexive Banach values

11:15 - 12:15 Hideshi Yamane (Kwansei Gakuin Univ.)
Local existence for nonlinear Cauchy problems with small analytic data

13:30 - 14:30 Keisuke Uchikoshi (National Defense Academy of Japan)
Singularity propagation of compressible perfect fluid

14:45 - 15:45 Joe KAMIMOTO (Kyushu Univ.) and Toshihiro Nose (Kyushu Univ.)
Newton polyhedra and oscillatory integrals

16:00 - 17:00 Shinichi Tajima (Tsukuba Univ.)
Polar varieties and holonomic $\mathcal{D}_X$ module

November 16, Wednesday

9:00 - 10:00 Naofumi Honda (Hokkaido Univ.) and Luca PRELLI (Univ. Padova)
Multi-specialization and multi-asymptotic expansions

10:15 - 11:15 Susumu Yamazaki (Nihon Univ.)
Boundary Values of Ultradistribution Solutions to Regular-Specializable Systems

11:30 - 12:00 Dennis Bacani (Sophia Univ.)
Existence and uniqueness theorem for a class of singular nonlinear partial differential equations

13:30 - 14:30 Kunio Ichinobe (Aichi Univ. of Education)
Summability of formal solution of Cauchy problem for some PDE with variable coefficients

14:45 - 15:45 Kiyoomi KATAOKA (Univ. Tokyo) and Nobuko Takeuchi (Tokyo Gakugei Univ.)

The non-integrability of some system of fifth-order partial differential equations describing surfaces containing 6 families of circles

November 17, Thursday

10:00 - 11:00 Hidetoshi Tahara (Sophia Univ.)
Maillet type theorem and Gevrey regularity in time of solutions to nonlinear partial differential equations

11:15 - 12:15 Naofumi Honda (Hokkaido Univ.) and Kouhei UMETA (Hokkaido Univ.)
Vanishing theorem for holomorphic functions of exponential type and Laplace hyperfunctions

13:30 - 14:30 Takashi Aoki (Kinki Univ.) and Mika TANDA (Kinki Univ.)
Voros coefficients of hypergeometric differential equations with a large parameter

14:45 - 15:45 Hiroshi Yamazawa (Caritas Junior College)
Borel summability of a formal solution for Cauchy problem of some linear partial differential equations

16:00 - 17:00 Masafumi Yoshino (Hiroshima Univ.)
Singular integrability and monodromy property of a resonant Hamiltonian system

November 18, Friday

10:00 - 11:00 Shingo KAMIMOTO (Univ. Tokyo) and Tatsuya Koike (Kobe Univ.)
On the Borel summability of 0-parameter solutions of nonlinear ordinary differential equations

11:15 - 12:15 Youko Umeta (Hokkaido Univ.)
On a construction of instanton-type solutions for the second Painlevé hierarchy

13:30 - 14:30 Kouhei Iwaki (RIMS, Kyoto Univ.)
Parametric Stokes phenomena for Painlevé equations

14:45 - 15:45 Sampei Hirose (RIMS, Kyoto Univ.)
On the Stokes geometry for the hypergeometric system of type (1,4)

16:00 - 17:00 Tatsuya Koike (Kobe Univ.) and Yoshitsugu TAKEI (RIMS, Kyoto Univ.)
Exact WKB analysis of second-order non-homogeneous linear differential equations — Bifurcated integral and Borel summability —

Contents

Preface i

Program ii

Articles

1. Yasunori Okada, Massera type theorems in hyperfunctions with reflexive Banach values 1
2. Hideshi Yamane, A Banach algebra and Cauchy problems with small analytic data 15
3. Keisuke Uchikoshi, Singularity propagation of compressible perfect fluid in a complex domain 21
4. Joe Kamimoto and Toshihiro Nose, On oscillatory integrals with C^∞ phases 31
5. Shinichi Tajima, On polar varieties, logarithmic vector fields and holonomic D-modules 41
6. Susumu Yamazaki, Boundary values of ultradistribution solutions to regular-specializable systems 53
7. Dennis B. Bacani and Hidetoshi Tahara, On existence and uniqueness theorems for singular nonlinear partial differential equations 69
8. Kunio Ichinobe, Summability of formal solution of Cauchy problem for some PDE with variable coefficients 81
9. Kiyoomi Kataoka and Nobuko Takeuchi, The non-integrability of some system of fifth-order partial differential equations describing surfaces containing 6 families of circles 95
10. Hidetoshi Tahara, Time regularity in Gevrey classes of solutions to general nonlinear partial differential equations 119
11. Kohei Umeta, Vanishing theorem for holomorphic functions of exponential type and Laplace hyperfunctions 137
12. Takashi Aoki and Mika Tanda, Characterization of Stokes graphs and Voros coefficients of hypergeometric differential equations with a large parameter 147
13. Hiroshi Yamazawa, Borel summability of a formal solution for Cauchy problem of some linear partial differential equations 163
14. Masafumi Yoshino, Smooth-integrable and analytic-nonintegrable resonant Hamiltonians 177
15. Shingo Kamimoto and Tatsuya Koike, On the Borel summability of 0-parameter solutions of nonlinear ordinary differential equations 191

16. Yoko Umeta, Instanton-type solutions with free $(m+1)$-parameters for the m-th member of the first Painlevé hierarchy 213
17. Kohei Iwaki, Parametric Stokes phenomena and Voros coefficients of the second Painlevé equation 221
18. Sampei Hirose, On the Stokes geometry for the Pearcey system and the (1,4) hypergeometric system 243
19. Tatsuya Koike and Yoshitsugu Takei, Exact WKB analysis of second-order non-homogeneous linear ordinary differential equations 293