ランダム作用素のスペクトルと関連する話題
Spectra of Random Operators and Related Topics

平成２４年度科研費基盤研究（C）「定常点過程論の枠組みによるランダム作用素のスペクトル統計の研究」（代表者：慶應義塾大学医学部　南　就将）、平成２４年度科研費基盤研究（C）「ランダムシュレディンガー作用素のスペクトルの確率論的研究」（代表者：京都大学大学院人間・環境学研究科　上木直昌）および平成２４年度科研費基盤研究（A）「シュレディンガー方程式のスペクトル・散乱理論の研究」（代表者：東京大学大学院数理科学研究科　中村　周）による表記の研究集会を下記のように開催します。

日程/Date 平成２４年１２月５日（水）－７日（金）/December 5-7, 2012

場所/Venue 京都大学　人間・環境学研究科棟　２階２２６室/
Room 226, Graduate School of Human and Environmenetal Studies Bldg.,
Kyoto University

組織員会：中村　周（東京大学）、上木 直昌（京都大学）、南 就将（慶應義塾大学）
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プログラム/Program

12 月 5 日 (水)/Dec. 5

10:30–11:20 Takuya Mine (Kyoto Inst. Tech)
On the local singularity of the Fourier transform of the Anderson type random potential.

11:30–12:20 Masahiro Kaminaga (Tohoku Gakuin Univ.)
On the analyticity of density of states. (joint work with Krishna, M. and S. Nakamura)

14:00–14:50 Yosuke Harashima and Keith Slevin (Osaka Univ.)
Numerical study of the metal-insulator transition in a disordered interacting system using density functional theory and local density approximation.

15:00–15:50 Makoto Katori (Chuo Univ.)
Determinantal formula appearing in non-determinantal process.

16:10–17:00 Taro Nagao (Nagoya Univ.)
Spectral density of bipartite scale-free networks.

12 月 6 日（木）/Dec. 6

10:00–10:50 Krishna Maddaly (Institute of Mathematical Science, India)
Local statistics for a class of decaying randomness in higher dimension.

11:00–11:50 Frédéric Klopp (Univ. Pierre et Marie Curie)
Interacting fermions in a random potential: a simple model.

13:30–14:20 Koji Kobayashi (Sophia Univ.)
Localization of Dirac electrons.

14:30–15:20 Sergio Andraus (Univ. Tokyo)
Dunkl Processes: Freezing Behavior and Diffusion-Scaling Transformation into the Calogero-Moser Systems.

15:40–16:30 Takashi Imamura (Univ. Tokyo)
Replica analysis of the one-dimensional stationary Kardar-Parisi-Zhang equation.

16:40–17:30 Naomasa Ueki (Kyoto Univ.)
Anderson localization in Gaussian random magnetic fields.

12 月 7 日（金）/Dec. 7

10:00–10:50 Tohru Koma (Gakushuin Univ.)
Quark confinement in Yang-Mills theory in spatial dimension two.

11:00–11:50 Shin'ichi Kotani (Kwansei Gakuin Univ.)
A random Jacobi matrix arising from beta-ensemble.

12:00-12:50 Fumihiko Nakano (Gakushuin Univ.)
Level statistics for 1-dimensional random Schroedinger operator.

（2012 年 11 月 29 日現在）

Abstracts

Krishna Maddaly: Local statistics for a class of decaying randomness in higher dimension.

In this joint work with Dhriti Ranjan Dolai,we show that for a sub class of models considered by Kirsh-Krishna-Obermeit, we show level repulsion at a countable set of energies in higher dimension. We note that for the same class of models there is Poisson statistics in the pure point spectral regime.

Frédéric Klopp: Interacting fermions in a random potential: a simple model.

In this talk, we consider n quantum fermions in a volume V at density ρ (i.e. $n = \rho V$) each in the same random background. They interact through repulsive pair potentials of finite range. We will present the analysis of the ground state and the ground state energy (per particle) for a simple system of one dimensional quantum fermions interacting in a random background in the limit $n \to +\infty$ when ρ is small but fixed. The talk is based on joint work with N. Veniaminov (U. Paris 9).

Numerical study of the metal-insulator transition in a disordered interacting system using density functional theory and local density approximation

Department of Physics, Osaka University, Japan
Yosuke Harashima and Keith Slevin

We report a numerical analysis of the critical behavior of the metal-insulator transition in a model of a doped semiconductor. The relative importance of the roles played by disorder and electron-electron interaction in this transition is still not clear. Moreover, while the critical behavior for the Anderson transition for systems of non-interacting electrons has been determined precisely [1], how the critical behavior is affected by electron-electron interactions is not known.

We calculate the electronic ground state in a doped semiconductor using density functional theory and the local density approximation [2]. Multi-fractal analysis [3] of the Kohn-Sham orbital shows clear evidence for a metal-insulator transition as a function of doping concentration [4].

[1] K. Slevin, *et al.*, Phys. Rev. Lett. **82**, 382 (1999)
[2] R. M. Martin, *Electronic Structure: Basic Theory and Practical Methods*, Cambridge University Press (2008)
[3] A. Rodriguez, *et al.*, Phys. Rev. B **84**, 134209 (2011)
[4] Y. Harashima, *et al.*, Int. J. Mod. Phys. Conf. Ser. **11**, 90 (2012)