会议日程

3 月 18 日上午

明德楼 201 会议室

09:00-09:50　**Wei-Min Wang** (Paris-Cergy University, 上海纽约大学)

10:10-11:00　**杨帆** (清华大学)

11:00-11:50　**吴炜** (上海纽约大学)

3 月 18 日下午

自由讨论

3 月 19 日上午

腾讯会议：941-3722-1248

09:00-09:50　**朱湘禅** (中科院数学所)

10:10-11:00　**朱蓉禅** (北京理工大学)

11:00-11:50　**葛灵睿** (北京大学)

3 月 19 日下午

14:00-14:50　**顾陈琳** (清华大学)　　明德楼 201 会议室

15:00-15:50　**黄逸超** (北京理工大学)　明德楼 201 会议室

15:50-16:40　**潘　亿** (Institute of Science and Technology Austria)

腾讯会议：941-3722-1248

Titles and Abstracts

1) The arithmetic phase transition for the almost Mathieu operator

Lingrui Ge (葛灵睿), Peking University

Abstract: The arithmetic phase transition conjecture of the almost Mathieu operator is proposed by Jitomirskaya in 1994. We will introduce new proofs and generalizations of it via quantitative structured reducibility method. This is based on several joint works with Jiangong You, Xin Zhao and Qi Zhou.

2) Quantitative homogenization of interacting particle systems

Chenlin Gu (顾陈琳), Tsinghua University

Abstract: This talk presents that, for a class of interacting particle systems in continuous space, the finite-volume approximations of the bulk diffusion matrix converge at an algebraic rate. The models we consider are reversible with respect to the Poisson measures with constant density, and are of non-gradient type. This approach is inspired by recent progress in the quantitative homogenization of elliptic equations. Along the way, a modified Caccioppoli inequality and a multiscale Poincare inequality are developed, which are of independent interest. The talk is based on a joint work with Arianna Giunti and Jean-Christophe Mourrat.

3) The extended Seiberg bound: motivations, generalizations and applications

Yichao Huang (黄逸超), Beijing Institute of Technology

Abstract: The Seiberg bounds form a set of necessary and sufficient conditions under which correlations functions in Liouville conformal field theory are well-defined. Since the probabilistic construction of Liouville correlations functions by David, Kupiainen, Rhodes and Vargas, a probabilistic version of the Seiberg bounds can be obtained via the theory of Gaussian Multiplicative Chaos. We will give a brief review on this construction, and then explain its boundary version, where a new class of Gaussian Multiplicative Chaos emerges naturally. If time permits, we will explain several other applications of the extended Seiberg bound, e.g. to the study of random analytic functions.

4) Reducibility of quasi-periodic cocycles valued in symplectic groups

YI Pan (潘亿), Institute of Science and Technology Austria

Abstract: Reducibility of quasi-periodic cocyles valued in symplectic groups is related to the spectrum of discrete Schrödinger operators on strips. We will talk about a global reducibility result in real analytic category: given one parameter families of such cocycles, for almost every parameter, either the maximal Lyapunov exponent is positive, or the cocycle is almost reducible to some compact model. The techniques of the proof combine Kotani theory, KAM theory and in particular study of hyperbolicity of renormalization operator. This is a joint work with Artur Avila and Raphaël Krikorian.

5) On nonlinear Anderson localization

Wei-Min Wang, Cergy Paris University and NYU Shanghai

Abstract: Anderson localization is a basic physical phenomenon, which has inspired some deep mathematics. Here we would like to address the further question of nonlinear Anderson localization. This talk is based on the joint works with J. Bourgain, W. Liu, I. Kachkovskiy, J. Geng, Y. Sun, Y. Shi, and others.

6) Massless phases for the Villain model in d>=3

Wei Wu (吴炜), NYU Shanghai

Abstract: The XY and the Villain models are mathematical idealization of real world models of liquid crystal, liquid helium, and superconductors. Their phase transition has important applications in condensed matter physics and led to the Nobel Prize in Physics in 2016. However we are still far from a complete mathematical understanding of the transition. The spin wave conjecture, originally proposed by Dyson and by Mermin and Wagner, predicts that at low temperature, large scale behaviors of these models are closely related to Gaussian free fields. I will review the historical background and discuss some recent progress on this conjecture in d>=3. Based on the joint work with Paul Dario (CNRS)

7) Delocalization and quantum diffusion of random band matrices in high dimensions

Fan Yang (杨帆), Tsinghua University

Abstract: Consider a general class of random band matrices H on the d-dimensional lattice of linear size L. The entries of H are independent centered complex Gaussian random variables with variances s_{xy}, which have a banded profile so that s_{xy} is negligible if $|x-y|$ exceeds the band width W. In dimensions $d\ge 7$, we prove that as long as $W\geq L^\delta $ for a small constant $\delta>0$, with high probability the bulk eigenvectors of H are delocalized in the sense that their localization lengths are comparable to L. In addition, we show that the delocalization is closely related to the quantum diffusion of this model, namely, the Green's function behaves in a similar way as that of a classical diffusion. Our proof is based on a high-order expansion of the Green's functions of H, where the key point is to show a self-energy renormalization up to arbitrary high order. Based on joint works with Changji Xu, Horng-Tzer Yau and Jun Yin.

8) A stochastic analysis approach to lattice Yang--Mills

Rongchan Zhu (朱蓉禅), Beijing Institute of Technology

Abstract: We develop a new stochastic analysis approach to the lattice Yang--Mills model at strong coupling in any dimension $d>1$, with t' Hooft scaling βN for the inverse coupling strength. We study their Langevin dynamics, ergodicity, functional inequalities, large N limits, and mass gap. Assuming $|\beta| < \frac{N-2}{32(d-1)N}$ for the structure group $SO(N)$, or $|\beta| < \frac{1}{16(d-1)}$ for $SU(N)$, we prove the following results.
The invariant measure for the corresponding Langevin dynamic is unique on the entire lattice, and the dynamic is exponentially ergodic under a Wasserstein distance. The finite volume Yang--Mills measures converge to this unique invariant measure in the infinite volume limit, for which Log-Sobolev and Poincare inequalities hold. These functional inequalities imply that the suitably rescaled Wilson loops for the infinite volume measure has factorized correlations and converges in probability to deterministic limits in the large N limit, and correlations of a large class of observables decay exponentially, namely the infinite volume measure has a strictly positive mass gap. Our method improves earlier results or simplifies the proofs, and provides some new perspectives to the study of lattice Yang--Mills model.

9) Stochastic quantization to perturbation theory of Φ^4_2: asymptoticity and short distance

Xiangchan Zhu (朱湘禅), Chinese Academy of Science

Abstract: In this talk we study the perturbation theory of Φ^4_2 model on the whole plane via stochastic quantization. We use integration by parts formula (i.e. Dyson-Schwinger equations) to generate the perturbative expansion for the k-point correlation functions, and prove bounds on the remainder of the truncated expansion using SPDE estimates; this in particular proves that the expansion is asymptotic. Furthermore, we derive short distance behaviors of the 2-point function and the connected 4-point function, also via suitable Dyson-Schwinger equations combined with SPDE arguments. This talk is based on joint work with Hao Shen and Rongchan Zhu.