7 月 11 日　08:30-09:00

Quantum Brownian motion

Yan Gu（顾雁）

University of Science and Technology of China, Hefei

Abstract: After replacing the reduced density matrix of a quantum harmonic oscillator linearly coupled to a thermal bath with its ‘characteristic function’ (a non-negative definite function on the Heisenberg-Weyl group), the master equation of the density matrix could be transformed into a first-order linear partial differential equation of the characteristic function. We examine the physical meaning of the solutions of the Caldeira-Leggett (CL) master equation and found: (1) The predicted steady states fulfill the positivity requirement if and only if $\beta\hbar\omega \le 2$, where $\beta = 1/k_B T$; (2) When $\beta\hbar\omega \le 2$, the reduced density matrix of the Brownian particle in steady state may be expressed as a mixture of Gaussian states with an uniform variance of position σ^2 which satisfies the inequality $\frac{\beta\hbar^2}{4m} \le \sigma^2 \le \frac{1}{\beta\omega^2 m}$; in particular the Gaussian states with $\sigma^2 = \frac{\beta\hbar^2}{4m}$ are distinguished by the property of having the least initial production rate for local entropy; (3) If the initial state of the Brownian particle is a Gaussian state with $\sigma^2 < \frac{\beta\hbar^2}{4m}$, then the positivity of the density matrix will be violated in its early stage of evolution at arbitrary high temperature regime.

7 月 11 日　09:00-09:30

Geometric momentum：motivation, theory and experiment

Quanhui Liu（刘全慧）

Hunan University, Changsha

Abstract: The theoretical description of the quantum motion of a particle constrained to a curved space has been a matter of controversy for a long time, and the problem arises because Dirac quantization on a curved manifold leads to operator-ordering ambiguities. For resolving this problem, it is routine to consider the curved space as a hypersurface, where extrinsic curvature dependent modifications to the Hamiltonian and momentum operator are predicted and experimentally confirmed. Finally, the historical problem is also solved.

7 月 11 日 09:30-10:00

Formalism of path integrals in momentum space and in mixed spaces

Guangshen Yang（杨光参）

Wenzhou University

Abstract: Motivated by semi-classical theory, we define the Lagrangians in the momentum space and in mixed position-momentum spaces directly. In terms of the so-defined Lagrangians, the actions and the propagators are directly defined in the spaces, not as the Fourier transforms of their counterparts in the configuration space.

7 月 11 日 10:30-11:00

Discrete symmetries in the ten-fold way and random matrix ensembles

Martin Sieber

University of Bristol, UK

Abstract: Wigner and Dyson classified quantum systems into three symmetry classes according to their behavior under time reversal. In the 1990s Altland and Zirnbauer extended this classification to ten symmetry classes by including systems that have a mirror symmetry in their spectra. It is well-known that additional discrete geometric symmetries can alter the Altland/Zirnbauer classification. In the presence of these symmetries, the Hilbert space needs to be reduced into invariant subspaces. The reduced systems can then be classified in the ten-fold way. We provide a simple and complete theory on how discrete geometric symmetries affect the ten-fold classification. It is obtained by an extension of Wigner's core presentation theory and uses simple indicators to determine the symmetry class. We further introduce a symmetrization method for constructing random matrix ensembles in the ten-fold symmetry classes with additional geometric symmetries. We illustrate our theoretical results with examples.

7 月 11 日　　11:00-11:30

Exact distribution of spacing ratios for random and localized states in quantum chaotic systems

Santosh Kuma

Shiv Nadar University, India

Abstract: Typical eigenstates of quantum systems, whose classical limit is chaotic, are well approximated as random states. Corresponding eigenvalue spectra are modeled through an appropriate ensemble described by random matrix theory. However, a small subset of states violates this principle and displays eigenstate localization, a counterintuitive feature known to arise due to purely quantum or semiclassical effects. In the spectrum of chaotic systems, the localized and random states interact with one another and modify the local spectral statistics. In this talk, we will present a 3×3 random matrix model to describe such coexisting random and localized states. This model is used to obtain exact distribution of the ratio of consecutive spacings between the corresponding eigenvalues. We consider time-reversal-invariant as well as noninvariant scenarios. Finally, we show that our analytical results describe well the spectra computed from realistic physical systems that exhibit localized eigenmodes.

7 月 11 日　14:30-15:00

Correspondence principle of work distributions in Bose-Hubbard model

Haitao Quan（全海涛）

Peking University

Abstract: In this talk, I will show the correspondence principle between the quantum and the classical work distributions in Bose-Hubbard model. Even though the interaction and the indistinguishability of identical particles increase the complexity of the system, we find that in Bose-Hubbard model the quantum work distribution still converges to its classical counterpart in the semi-classical limit. Our results imply that there exists a correspondence principle between quantum and classical work distributions in an interacting quantum many-body system, especially in the large particle number limit, and further justify the definition of quantum work via two-point energy measurements in quantum many-body systems.

7 月 11 日　15:00-15:30

Random models to characterize the work statistics of quenches in quantum complex systems

Fabricio Toscano

The Federal University of Rio de Janeiro, Brazil

Abstract: Nowadays quantum chaotic systems are associated with quantum systems that has specific properties of eigenspectra, eigenstates, and dynamics of the system. They include one-body quantum chaos (where in general exist a true chaotic classical counterpart) and many-body quantum chaotic systems which do not necessarily have a classical chaotic limit. In recent years the study of thermodynamics properties of quantum chaotic systems has been study in the context of thermalisation of isolated quantum systems due to interparticle interactions. Here we address the problem of how to describe the work statistics of quenchs in quantum chaotic systems using random models. We consider a particular definition of the work probability density function (pdf) for coherent quantum processes that allows the verification of the quantum version of the celebrated fluctuation theorems, due to Jarzynski and Crooks , that apply when the system is driven away from an initial equilibrium thermal state. This particular pdf, that we call “Two Point Energy Measurement (TPEM) pdf”, depends basically on the details of the initial and final Hamiltonians, on the temperature of the initial thermal state and on how some external parameter is changed during the coherent process. However, first we use the Random Matrix Theory to derive a simple analytic expression that describes the general behavior of the work characteristic function G(u), associated with th TPEM work pdf for sudden quenches, valid for all the traditional Gaussian ensembles of Hamiltonians matrices. This formula well describes the general behavior of G(u) calculated from single draws of the initial and final Hamiltonians in all range of temperatures (viz. the ergodic property of Gaussian ensembles is verified to the description of work statistics) . We discuss the application of our RMT description of the work statistics in quantum chaotic systems using as a model the single-mode Dicke Hamiltonian in the chaotic regime. Second, inspired by the previous

work we develop a random model to describe a TPEM pdf in many-body quantum systems. Here, we also develop a simple analytic expression that describes the general behavior of the work characteristic function G(u), associated with the TPEM work pdf for sudden quenches. We test our approach in a one-dimensional system of spin-1/2 particles that interact through nearest-neighbor (NN) couplings.

References:

[1] C. Jarzynski, Phys. Rev. Lett. 78, 2690 (1997). [2] G. E. Crooks, Phys. Rev. E **60**, 2721 (1999).

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7 月 11 日　16:00-16:30

Quantum ergodicity and mixing

Biao Wu（吴飙）

Peking University

Abstract: We will introduce a set of new definitions for ergodicity and mixing in quantum dynamics, which are inspired by von Neumann's work in 1929. Accordingly, we introduce two parameters to quantitatively describe how ergodic and mixing quantum systems are. We show both in general and with examples, such as quantum kicked rotor, that these definitions are consistent with our intuitive understanding of ergodicity and mixing.

References:

[1] Zhang, Quan and Wu PRE **94**, 022150 (2016);

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7 月 11 日　16:30-17:00

Semiclassical theory for out-of-time-order correlators

Rodolfo Jalabert

University of Strasbourg, France

Abstract: We develop a semi-classical approach for calculating the out-of-time-order correlator of quantum operators in a classically chaotic low-dimensional system. A systematic expansion in powers of the Planck constant allows us to determine the growing and saturation regimes according to the temperature of the system.

7 月 11 日　17:00-17:30

Out-of-time-order correlation and its experimental measurement

Xinhua Peng（彭新华）

University of Science and Technology of China, Hefei

Abstract: The idea of the out-of-time-order correlator (OTOC) has recently emerged in the study of both condensed matter systems and gravitational systems. It not only plays a key role in investigating the holographic duality between a strongly interacting quantum system and a gravitational system, it also diagnoses the chaotic behavior of many-body quantum systems and characterizes information scrambling. Based on OTOCs, three different concepts—quantum chaos, holographic duality, and information scrambling—are found to be intimately related to each other. Despite its theoretical importance, the experimental measurement of the OTOC is quite challenging, and thus far there is no experimental measurement of the OTOC for local operators. Here, we report the measurement of OTOCs of local operators for an Ising spin chain on a nuclear magnetic resonance quantum simulator. We observe that the OTOC behaves differently in the integrable and non-integrable cases. Based on the recent discovered relationship between OTOCs and the growth of entanglement entropy in the many-body system, we extract the entanglement entropy from the measured OTOCs, which clearly shows that the information entropy oscillates in time for integrable models and scrambles for non-intgrable models. With the measured OTOCs, we also obtain the experimental result of the butterfly velocity, which measures the speed of correlation propagation. Our experiment paves a way for experimentally studying quantum chaos, holographic duality, and information scrambling in many-body quantum systems with quantum simulators.

7 月 12 日　08:30-09:00

Quantum control

Celso Grebogi

University of Aberdeen, UK

Abstract: Quantum chaos is referred to the study of quantum manifestations of systems that are chaotic in the classical limit. Most previous research in the field of quantum chaos focused on the non-relativistic quantum regime. Recently the field of relativistic quantum chaos has emerged, due to the tremendous development of research on graphene and topological insulators. Phenomena such as relativistic quantum scarring, chaotic scattering, and tunneling have been explored. The speaker will discuss a number of fundamental issues in relativistic quantum chaos, but from the perspective of quantum control or modulation: how classical chaos can be exploited to harness relativistic quantum behaviors in Dirac fermion and graphene systems? Transport through quantum dot and resonant tunneling will be used as two prototypical examples to illustrate the principle that chaos-based quantum control can be advantageous and experimentally feasible.

References:

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7 月 12 日　09:00-09:30

Fading in resonance transmission through a complex environment

Dmitry Savin

Brunel University London, UK

Abstract: Scattering on a resonance state coupled to the background of many chaotic states is characterized by fluctuations, which fade an established transmission. Such a problem arises naturally, e.g., when dealing with wave propagation in the presence of a complex environment. This talk will formulate and discuss a non-perturbative approach to study such fluctuations, taking into account also finite losses in the background. The approach is based on random matrix theory and the strength function formalism, yielding a number of exact results for various scattering statistics. This includes the joint and marginal distributions of the reflection and transmission intensities and phases, which are derived at arbitrary coupling to the background with finite absorption. The intensities and phases are found to exhibit highly nontrivial statistical correlations, which remain essential even in the limit of strong absorption. Potential applications in the context of reverberation chambers and microwave communications are also briefly discussed.

7 月 12 日　09:30-10:00

Level missing statistics and power spectrum analysis of microwave networks and three-dimensional chaotic microwave cavities

Leszek Sirko

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Abstract: We present the experimental study of missing level statistics of microwave networks and three-dimensional chaotic microwave cavities. The investigation is reinforced by the power spectrum of level fluctuations analysis which also takes into account missing levels [2, 1, 3]. On the basis of our data sets we demonstrate that the power spectrum of level fluctuations in combination with short- and long-range spectral fluctuations provides a powerful tool for the determination of the fraction of randomly missing levels in systems that display wave chaos. The experimental results are in good agreement with the analytical expressions that explicitly take into account the fraction of observed levels φ. We show that in the case of incomplete spectra with many unresolved states forming clusters the above procedures may fail. In such a case the random matrix theory calculations can be applied for the determination of the fraction of missing levels.

References:

[1] M. Bia lous, V. Yunko, S. Bauch, M. Lawniczak, B. Dietz, and L. Sirko, Phys. Rev. Lett. **117**, 144101 (2016).

[2] B. Dietz, V. Yunko, M. Bia lous, S. Bauch, M. Lawniczak, and L. Sirko, Phys. Rev. E **95**, 052202 (2017).

[3] M. Lawniczak, M. Bia lous, V. Yunko, S. Bauch, B. Dietz, and L. Sirko, Acta Phys. Pol. A **132**, 1672 (2017).

7 月 12 日　10:30-11:00

Chaos-induced spin topological structure in kicked rotor

Chushun Tian（田矗顺）

Institute of Theoretical Physics, CAS, Beijing

Abstract: The kicked rotor is a “standard model” in studies of nonlinear dynamics. The kicked rotor without spin degree of freedom nowadays has been well studied. In this talk, I will present our recent result for a kicked rotor with spin degree of freedom. We find a dynamical phenomenon mathematically equivalent to the integer quantum Hall effect occurs, where Planck’s quantum mimics the magnetic field. I will show that this phenomenon is of chaos origin.

7 月 12 日　11:00-11:30

Super ballistic wave packet spreading in double kicked rotors

Jiao Wang（王矫）

Xiamen University

Abstract: We investigate possible ways in which a quantum wave packet spreads. We show that in a general class of double kicked rotor systems, a wave packet may undergo super ballistic spreading; i.e., its variance increases as the cubic of time. The conditions for the observed super ballistic spreading and two related characteristic time scales are studied. Our results suggest that the symmetry of the studied model and whether it is a Kolmogorov-Arnold-Moser system are crucial to its wave packet dynamics. Our study also sheds new light on the exponential wave packet spreading phenomenon previously observed in the double kicked rotor systems.

References:

[1] P. Fang and J. Wang, Sci. China – Phys. Mech. Astron. **59**, 680011 (2016); arXiv: 1605.07452

7 月 12 日　14:30-15:00

Dynamical glass

Sergej Flach

Center for Theoretical Physics of Complex Systems, South Korea

Abstract: Classical many body interacting systems are typically chaotic and their micro-canonical dynamics ensures that time averages and phase space averages are identical. In proximity to an integrable limit the properties of the network of non-integrable action space perturbations help decide whether ergodicity will hold arbitrarily close to the limit (albeit with diverging relaxation times), or whether the system fragments into regular and chaotic parts and enters a non-ergodic dynamical glass phase at a finite distance to the integrable limit. This dynamical glass phase is induced by coherent localized excitations - generalized discrete breathers - with diverging averages of lifetimes.

References:

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7 月 12 日　　15:00-15:30

Many-body chaos: new approach to collective and single-particle motion in interacting systems

Thomas Guhr

University of Duisburg-Essen, Germany

Abstract: The field of quantum chaos originated in the study of spectral statistics for interacting many–body systems, but this heritage was almost forgotten when single–particle systems moved into the focus. In recent years new interest emerged in many–body aspects of quantum chaos. I will start by presenting our work on spreading, i.e. the conversion of energy and momentum in collective to single-particle degrees of freedom in a closed and finite system. This is related to but different from thermalization. I then turn to our recent results on a chain of interacting, kicked spins. We carry out a full-scale semi-classical analysis that is capable of identifying all kinds of genuin many–body periodic orbits. We show that the collective many–body periodic orbits can fully dominate the spectra in certain cases.

7 月 12 日　16:00-16:30

Semi-classics for strongly correlated bosonic many-body systems - A double-tracked approach

Quirin Hummel

University of Regensburg, Germany

Abstract: The theoretical study of quantum systems of interacting particles poses a fundamental challenge when mean-field plus quasi-particle pictures fail. We consider cases where this happens either due to (i) the absence of a large number of particles in few-body systems or (ii) a break-down of the quasi-particle picture due to quantum critical behavior. The analytical description by means of semi-classical techniques involves two complementary approaches. In the first case, we focus on Weyl laws for the smooth part of the full multi-particle spectrum of short-range interacting continuous one-dimensional systems where a universal feature emerges, irrespective of integrability or solvability of the investigated model. Whereas in the second case we apply torus quantization to a specific integrable model where quantum criticality relates to a classical bifurcation in order to describe discrete spectral features that are crucially affected by the finiteness of a large number of particles, where the later takes the role of an inverse effective Planck's quantum of action. Considering dynamical properties in the supercritical regime we find - despite integrability - the emergence of a local Ehrenfest time scale dominating the scrambling behavior as well as exponential growth of out-of-time-order correlators, both related to an unstable fix point that replaces chaoticity.

7 月 12 日　16:30-17:00

Quantum chaos within many-body integrable systems

Boris Gutkin

Holon lnstitute of Technology, Holon, lsrael

Abstract: It is usually assumed that integrable systems posses simple dynamics, while their energy levels are uncorrelated and follow Poissonian statistics. I will discuss how many-body nature of models can change this perception. It will be argued that in spite of seemingly simple dynamical equations, the set of periodic orbits/tori of many-body integrable systems can be quite complex. In particular, I will present a class of integrable spin chains where all periodic orbits are in one-to-one correspondence with periodic orbits of fully chaotic Arnold's cat map. On the other side, large energy scale spectral statistics of the corresponding quantum spin chains turn out to be intrinsically connected with the spectral statistics of quantum cat maps.

7 月 12 日　 17:00-17:30

Measure synchronization in an ensemble of coupled quantum systems

Xingang Wang（王新刚）

Shannxi Normal University, Xi'an

Abstract: By the approach of the measure synchronization, we study the collective behavior of an ensemble of coupled bosonic Josephson junctions. It is found that as the coupling strength increases, the two systems will be changed from the non-synchronous to synchronous states gradually. Remarkably, it is found that the introduction of a moderate mismatch to the system parameters could enhance synchronization, instead of deteriorate it. The mechanism underlying the observed phenomena is analyzed by tracing the measurement of the system trajectories in the phase space, which shows that under moderate parameter mismatch the trajectories undergo a significant change. Our study shed lights on the collective behavior of complex quantum systems, and might have implications to applications such as quantum information and computing.

7 月 13 日　08:30-09:00

Eigenvector distribution in certain random matrix ensembles

Eugene Bogomolny

Université Paris Sud, France

Abstract: The talk consists of two parts. The first is devoted to the construction of an exact eigenvector distribution for the Rosenzweig-Porter model in the intermediate regime where eigenfunctions are fractal. The second deals with power-law random banded matrices and ultra-metric matrices also in the intermediate regime where no analytical methods are applicable. It is found numerically that in this case eigenfunctions are fully extended but follow an unusual distribution which can be very well fitted by the generalized hyperbolic distribution.

7 月 13 日　09:00-09:30

Internal temperature of quantum chaotic systems at the nanoscale: detected by a qubit-probe

Wenge Wang（王文阁）

University of Science and Technology of China, Hefei

Abstract: In the statistical mechanics, temperature can be defined in several ways, which are equivalent in the thermodynamic limit, e.g., that by Boltzmann's entropy and that by Gibbs' entropy. But, there is by far no unique way for extrapolation to small quantum systems. Different understandings of this concept may lead to diverse predictions. We study this problem by employing a method, in which a studied small quantum system is coupled to a two-level system as a probe, the latter of which can be measured by measurement devices. For small quantum chaotic systems, we show that a temperature can be determined, the value of which is sensitive to neither the form, location, and strength of the probe-system coupling, nor the Hamiltonian and initial state of the probe. The temperature thus obtained turns out to have the form of Boltzmann temperature.

7 月 13 日　09:30-10:00

Study of statistical properties of eigenfunctions in chaotic quantum systems

Jiaozi Wang（王骄子）

University of Science and Technology of China, Hefei

Abstract: We study structural properties of eigenfunctions of perturbed Hamiltonians in unperturbed bases by a semi-perturbation theory. With this method, one can devide an eigenfunction in to a non-perturbative (NPT) part and a perturbative part. Using semi-classical analyses, we show that the smallest NPT region coincides with the classical allowed region. We also study the randomness of components of chaotic eigenfunctions in unperturbed basis by semi-classical analyses. Based on Berry's conjecture, we show that components in classical allowed region can be regarded as Gaussian random numbers, when appropriately rescaled with respect to the average shape of EFs. This suggests that, when a perturbed system changes from integrable to chaotic, deviation of the distribution of rescaled components in classically allowed regions from the Gaussian distribution may be employed as a measure for the \distance" to quantum chaos.

7 月 13 日 10:30-11:00

The local density of states in scarred systems with dissipation

Domenico Lippolis

Jiangsu University

Abstract: Here, the notion of local density of states is introduced for non-Hermitian Hamiltonians describing dissipative systems in both weakly- and strongly overlapping regimes. For chaotic dynamics, it is shown that, just like in closed systems, the local density of states characterizes phase space localization, such as scarring. Unlike real-space intensity field plots, Wigner- or Husimi- distributions, the local density of states is representation independent, and it accounts for the effects of dissipation on the dynamics and the decay of correlations. In this talk, a suitable local density of states is defined and related to the Green's function of a non- Hermitian Hamiltonian. Successively, the analysis is restricted to fully chaotic dynamics, and the dependence is shown of the local density of states on the dynamics of the closed system, and the dissipation. In perspective, the aim is to use semi-classical predictions from the linear/nonlinear theory of scars of Kaplan and Heller's. Some numerical evaluations of the local density of states are also shown for well-known quantized chaotic maps connected to both a one-channel- and a multiple-channel leaks.

7 月 13 日 11:00-11:30

Theoretical study of the effect of a transverse magnetic field in photodetachment microscopy

Kelvin Titimbo

Institute of Theoretical Physics, CAS, Beijing

Abstract: Photodetachment microscopy of negative ions is studied theoretically with a uniform transverse magnetic field superimposed to the standard electric field. We have aimed the description of reported experimental results using the quantum source theory. This method yields consistent description of the electron flux distribution for all field intensities and angular nature of the electronic source we studied. Our calculation showed that the presence of the field not only leads to a global displacement of the ring pattern along the ExB direction as expected, but also that the shape and size of the matter wave interference pattern changes as the magnetic field increases.

7 月 13 日　14:30-15:00

Chaos in Dirac Electron Optics: Emergence of a Relativistic Quantum Chimera

Ying-Cheng Lai（来颖诚）

Arizona State University, USA

Abstract: I will present a quantum scattering phenomenon in two-dimensional Dirac material systems where the manifestations of both classically integrable and chaotic dynamics emerge simultaneously and are electrically controllable. The distinct relativistic quantum fingerprints associated with different electron spin states are due to a physical mechanism analogous to a chiroptical effect in the presence of degeneracy breaking. The phenomenon mimics a chimera state in classical complex dynamical systems but here in a relativistic quantum setting - henceforth the term "Dirac quantum chimera," associated with which are physical phenomena with potentially significant applications such as enhancement of spin polarization, unusual coexisting quasi-bound states for distinct spin configurations, and spin selective caustics. Experimental observations of these phenomena are possible through, e.g., optical realizations of ballistic Dirac fermion systems.

7 月 13　15:00-15:30

Flat bands and where to find them

Alexei Andreanov

Center for Theoretical Physics of Complex Systems, South Korea

Abstract:

7 月 13 日　16:00-16:30

Investigating topological structures by microwave experiments with coupled dielectric resonators

Ulrich Kuhl

University Nice Sophia Antipolis, France

Abstract: I will present experimental microwave results showing topological features like topological protected states, flat bands, winding number etc. The experiment is based on evanescently coupled dielectric resonators realizing a system which can be described by tight binding theory. The SSH chain, here weakly coupled dimers with strong intra dimer couplings, exhibits a state at 'zero energy' which is topologically protected. We have experimentally exploited the structures and stability of this state. In the two-dimensional version, the Lieb lattice, the same type of state can be realized, but it is hidden within the flat bands created due to the two dimensional structures. This degeneracy is lifted due to next-nearest neighbor coupling which we realize experimentally. In a proof of principle experiment we have used the SSH chain to implement a reflective dimer by changing the absorption or the 'eigenenergy' of the defect. Depending on the parameter the structure at the defect energy is transparent or reflective without creating large absorption within the system, thus gaining a large dynamical range of the limiter, given by the difference between the limiting threshold and the limiters damage threshold. Finally, if time allows, I will discuss measurements, where the winding number of the transmission 'gaps' of a finite Fibonacci chain extracted from the reflection phases be detected. For this we use the concept of phasons based on the of the cut & project realization of the Fibonacci chain.

References:

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7 月 13 日　16:30-17:00

Quantum billiards, graphene billiards and neutrino billiards

Barbara Dietz

Lanzhou University, Lanzhou

Abstract: A central aspect of quantum chaos are the manifestations of features of the classical dynamics in the fluctuation properties of the eigenvalue spectrum of the corresponding quantum system. It has been established by now in numerous theoretical and experimental studies that the spectral fluctuation properties of generic, classically integrable systems follow Poisson statistics, in accordance with the Berry-Tabor conjecture. According to the Bohigas-Giannoni-Schmit conjecture the spectral fluctuation properties of classically chaotic systems coincide with those of random matrices from the Gaussian ensemble with the appropriate universality class. These conjectures were confirmed, e.g., for billiard systems which are most suitable for such studies because the integrability of their classical dynamics only depends on the billiard shape. The objective of the work presented in my talk was to find out whether this is also the case for graphene and neutrino billiards. I will illustrate based on results for graphene and neutrino billiards with the shapes of classically integrable billiards, that the spectral properties may change drastically depending on the structure of the boundary [1] and due to differing boundary conditions, respectively.

References:

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7 月 13 日　17:00-17:30

Relativistic Quantum Chaos

Liang Huang（黄亮）

Lanzhou University, Lanzhou

Abstract: The searching for signatures of classically non-integrable dynamics in quantum systems comprises the rich interdisciplinary studies of quantum chaos. Relativistic quantum chaos is an emerging field that attracts much attention in recent years. One key subject is the confined Dirac fermion system, whose most peculiar phenomena is the spontaneous T-symmetry breaking and consequently chiral scars. In this talk, we present our investigation of this system from both the semi-classical perspective and the microscopic boundary reflection process, to reveal the microscopic T-broken mechanism, the scarring condition, and the chiral origin. A controlling scheme is then devised to modulate the chirality of scars. These results form complete understandings of this system, and open new scenarios for important novel device applications.

References:

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