Program INT13-1b

Quantum Noise

May 20 – 24, 2013

Monday, May 20, 2013

Room C421, Physics/Astronomy Tower

- 11:00 am: Israel Klich, University of Virginia

  "Noise in tensor network states"

  Tensor network states are a useful class of variational wave functions for the study of many body physics. In this talk I will discuss fluctuations from the point of view of such states. In particular, I will describe how to compute full counting statistics of spin in matrix product states. I will derive the asymptotic corrections to the central limit theorem for magnetization distribution for finite but large blocks in analogy to the Edgeworth series. I also will show how the behavior of distributions for certain states with topological characteristics, such as the AKLT state, deviates from the predictions of central limit theorem. Finally, I will show how to use such states to describe systems at finite temperatures.

Tuesday, May 21, 2013

Room C421, Physics/Astronomy Tower

- 11:00 am: Eugene Demler, Harvard University

  "Learning about order from noise"

  The probabilistic character of measurement processes is one of the most fascinating aspects of quantum mechanics. In many-body systems quantum noise can reveal the non-local correlations and multiparticle entanglement in the underlying states. In this talk I will review recent theoretical and experimental progress in applications of the quantum noise analysis to the study of many body states of ultracold atoms. Examples include HBT correlations and detection of magnetic phases in optical lattices, pairing correlations in time of flight experiments, distribution of fringe contrast as a probe of in and out of equilibrium states of low dimensional condensates.

Wednesday, May 22, 2013

Room C421, Physics/Astronomy Tower

- 11:00 am: Lev Ioffe,Université Pierre et Marie Curie and Rutgers University

  "Universal negative magnetoresistance in the variable range hopping regime: a consequence of the sign disorder of the electron wave function"

  We predict the universal power law dependence of localization length on magnetic field in the strongly localized regime. This effect is due to the combined effect of the orbital quantum interference and the sign disorder of the electron wave function at large scales. The reason for the universality is that the problem of the electron tunneling in a random media belongs to the same universality class as directed polymer problem even in the case of wave functions of random sign. We present numerical simulations which prove this conjecture. Physically, the universal dependence of the localization length shows up in an anomalously large negative magnetoresistance in the hopping regime. I discuss the existing experiments that show anomalously large magnetoresistance and evidence for the appearance of the universal behavior.

Thursday, May 23, 2013

Room C421, Physics/Astronomy Tower

- 11:00 am: Anatoly Polkovnikov, Boston University

  "Nonadiabatic imaginary time quantum dynamics"

  In this talk I will describe imaginary time quantum dynamics in driven systems focusing on slow linear in time ramps. I will discuss similarities and differences between imaginary and real time dynamics and what kind if information can be extracted from the imaginary time evolution. I will briefly mention implementation of the latter in quantum Monte Carlo. As an application I will demonstrate how one can use these ideas to extract critical properties (static and dynamic) in systems driven through continuous quantum phase transitions.

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