Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

QE

Quantum Efficiency
Seminar und Colloquium

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On randomly interacting two-level boson systems: Spectral statistics, fidelity freeze and revivals

The *k*-body embedded ensembles of random matrices were originally introduced by Mon and French as a physically more plausible stochastic model of many-body systems governed by *k* body interactions. In this talk I will discuss some analytical and numerical results on the bosonic *k*-body embedded ensembles, focusing in the case where the bosons occupy *l=2* single-particle states.

I shall present results which describe the transition from harmonic-oscillator spectral statistics for *k=1*, to random-matrix type behavior for *k=n*, where *n* is the number of bosons. In particular, for the time-reversal invariant case, I discuss the presence of a quasi-degeneracy peak in the nearest-neighbour distribution, and its relation with the classical underlying dynamics. I will also present results on the dynamics of the ensemble by addressing the fidelity decay. We consider the case where the reference or unperturbed Hamiltonian contains the one-body terms and the diagonal part of the k-body embedded ensemble of random matrices, and the perturbation includes all the residual off-diagonal interaction terms. We calculate the ensemble-averaged fidelity with respect to an initial random state, and demonstrate that it displays the freeze of the fidelity. During the freeze of the fidelity, the ensemble averaged fidelity exhibits periodic revivals at integer values of the Heisenberg time, t_H. For a specific type of the residual interaction, it is shown that the periodicity of the revivals during the freeze of fidelity is t_H=k, thus relating the period of the revivals to the actual range of the interaction k. The two-mode Bose-Hubbard model will be shortly discussed.

Date: **Tuesday, December 13th, 2011 16:15 pm**
Location: **Lecture Hall 1, Hermann-Herder-Str. 3, Freiburg**

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