Zkušenosti z účasti na mezinárodní konferenci CEWQO 2013

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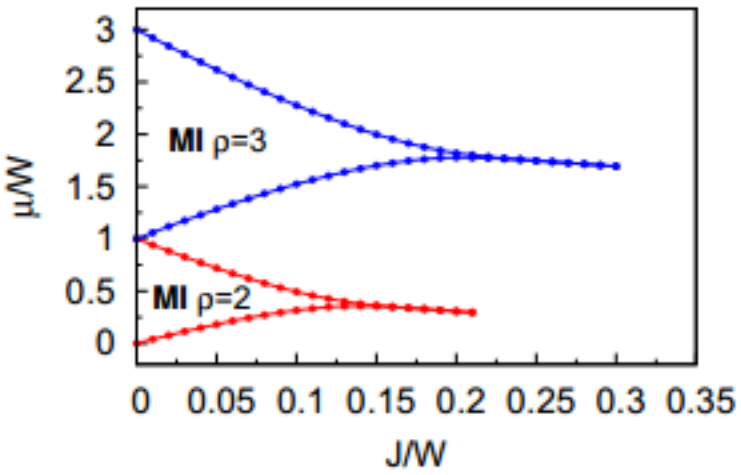
Počet účastníků: >200
Počet přednášek: 124
Počet posterů: 43

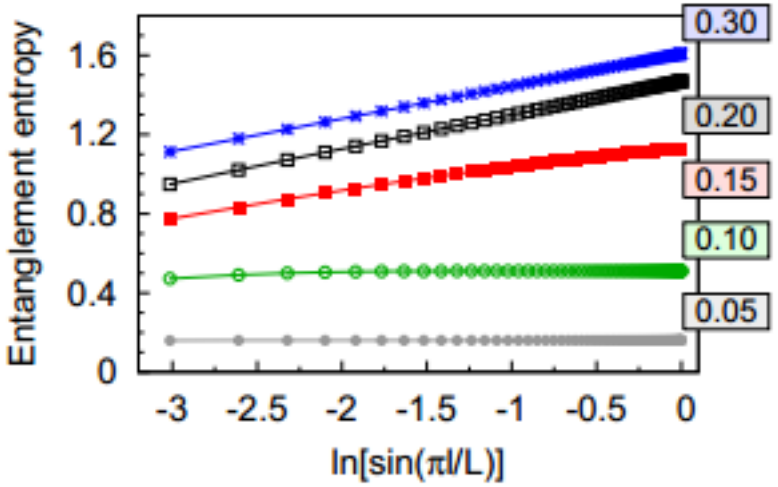
Zajímavé příspěvky na konferenci CEWQO’2013

T. Sowinski

One-dimensional extended Bose-Hubbard models with local three-body interactions



The phase diagram of the Bose-Hubbard model with pure three-body interactions. In contrast to standard Bose-Hubbard model in the first insulating lobe one finds two particles in each lattice site.



Entanglement entropy of the subchain of the length l for few example tunnelings J/W $(\rho = 2)$.

• The research is motivated by the recent experimental progress in controlling ultra-cold atoms, which resulted in necessity in theoretical models, able to provide realistic descriptions of the real quantum systems confined in optical lattices [1].

•The ground state phase diagram of a particular extension of the standard BH model is studied, assuming that mutual interaction between particles is of three-body origin. The effective three-body terms are attractive (for a repulsive gas) [2].

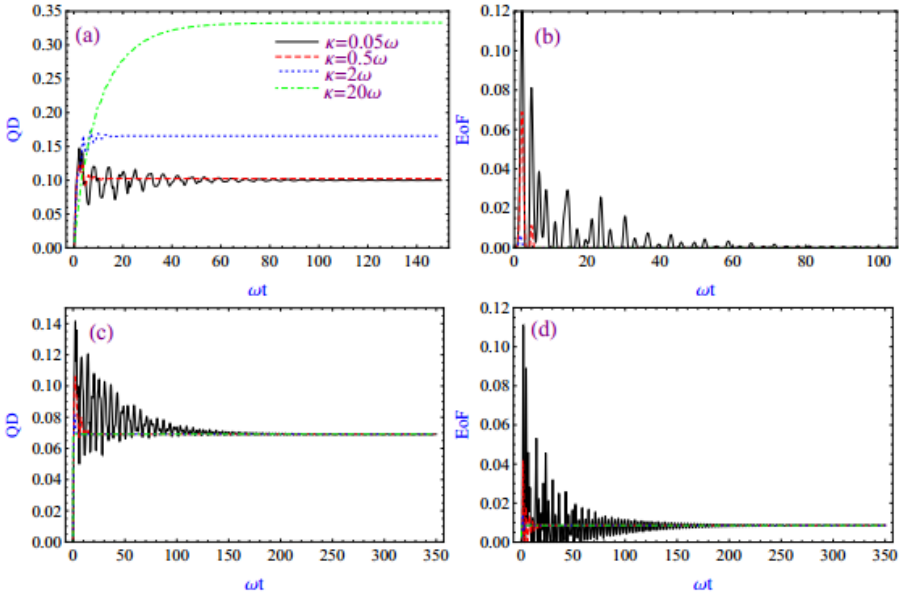
•The values of the critical tunneling for which the system undergoes the quantum phase transition from insulating to superfluid phase are estimated.

•The stability of insulating phases, in contrast to standard BH model, is enhanced for larger fillings.

[1] I. Bloch and W. Zwerger, Rev. Mod. Phys. 80, 885 (2008).
[2] T. Sowinski, Phys. Rev. A 85, 065601 (2012).

F. Altintas

Dissipative dynamics of atom-field entanglement in the ultrastrong-coupling regime



The effect of cavity decay rate κ (a) and (c) on quantum discord and (b) and (d) entanglement versus ωt for $|gg0\rangle$ initial state, $\kappa = 0.05\omega$ (black, solid), $\kappa = 0.5\omega$ (red, dashed), $\kappa = 2\omega$ (blue, dotted), and $\kappa = 20\omega$ (green, dot-dashed) in strong coupling regime with $g = 0.35\omega$.

•Rabi model, which describes the interaction of a two-level atom (a qubit) with a quantized single mode cavity field (a harmonic oscillator) is considered[1].

•The interaction between and atom and a cavity in the strong-coupling regime is described using the Lindblad master equation for the strong-coupling regime [2].

•The dynamics of atom-field entanglement for a system composed of two qubits resonantly coupled to a single mode leaky cavity field is investigated.

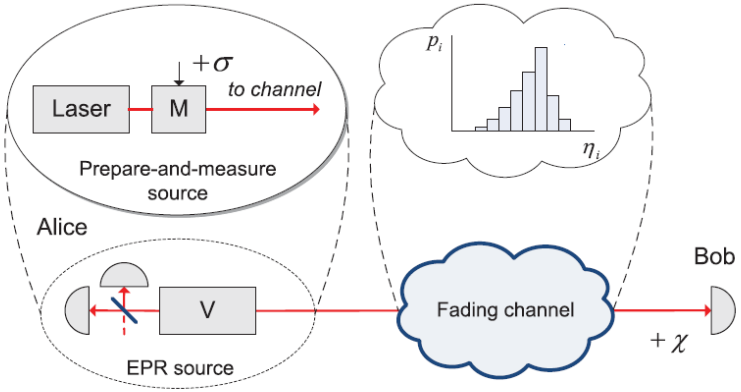
•The strong atom-field interaction is shown to induce atom-field entanglement in the steady states contrary to the weak-coupling.

[1] I. Rabi, Phys. Rev. 49 324 (1936)

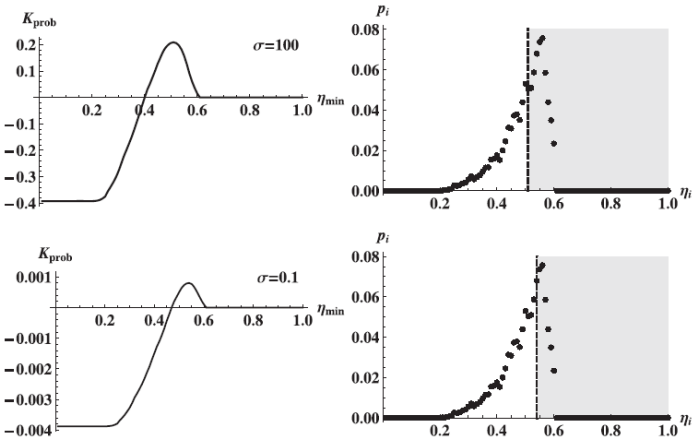
[2] F. Beaudoin, J. M. Gambetta and A. Blais, Phys. Rev. A 84 043832 (2011)

Vlastní prezentace

Continuous-variable quantum key distribution over fading channels



EPR entanglement-based QKD over a fading channel. Alice and Bob share an entangled state of variance V; one of the modes is transmitted to Bob through a fading channel described by a distribution of transmittance values $\{\eta_i\}$. While Alice directly applies heterodyne measurements, Bob makes homodyne measurements allowing him to characterize the channel and estimate excess noise. Left inset: the equivalent prepare-and-measure scheme. Alice generates a coherent state, displaces it in phase space with a variance of $\sigma = V - 1$ using the modulator M and sends it to Bob. Right inset: illustrative discretized transmittance distribution of a fading channel.



Left: effect of PS (represented by the start of the PS region) after the fading channel given in figure 9 on the security of the states against collective attacks in terms of the lower bound on the key rate (in bits per measurement), weighted by PS success probability, for high modulation variance $\sigma = 100$ (top) and low modulation variance $\sigma = 0.1$ in the presence of noise $\chi = 0.032$. Right: respective optimal PS region (bounded by the corresponding $\eta_{\min}$), maximizing the weighted key rate for given parameters, indicated atop of the experimentally obtained fading distribution.

• The study of the Gaussian continuous-variable (CV) quantum key distribution (QKD) protocols and Gaussian entanglement over the fluctuating fading channels performed in collaboration with doc. R. Filip from Palacky University and experimental group at Max Planck Institute for the science of Light in Erlangen (group of Prof. Leuchs) was presented.

• The effect of fading on the Gaussian entanglement and security against individual and collective Gaussian attacks is studied, conditions on security break from fading channels is obtained. Fluctuations due to beam-wandering are analyzed as a particular case.

• The method of sub-channels post-selection was introduced the possibility to restore or improve the entanglement resource degraded by the channel fading as well as restore the security of the Gaussian CV QKD in case it was lost due to was shown. The method was applied to the analysis in the case of a particular experimentally characterized 1.5 km free-space link at Max Planck Institute for the Science of Light in Erlangen and the usefulness of post-selection in this case was confirmed.

• Finally, the finite-size effects in the CV QKD protocols, possibly caused by the data ensemble size reduction due to post-selection were addressed and the stability of the result was shown upon the achievable sampling rates.