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EVROPSKÁ UNIE
MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY
OP Vzdělávání pro konkurenceschopnost
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Název projektu: Mezinárodní centrum pro informaci a neurčitost

Registrační číslo: CZ.1.07/2.3.00/20.0060

Zpráva z účasti na konferenci

Název konference:	20th Central European Workshop on Quantum Optics (CEWQO)
Datum konání:	16.6. - 20. 6. 2013
Místo:	Stockholm, Švédsko
Účastník konference:	Mgr. Vladyslav Usenko Ph.D.

Stručný popis konference:
Central European Workshop on Quantum Optics is one of the most representative annual European meetings dedicated to quantum optics and quantum information. Scientific scope of the workshop includes, but is not limited by: Fundamental aspects of quantum optics and quantum mechanics, Quantum correlations – entanglement, non-locality and -causality, Non-classical states, quantum tomography, Optical angular momentum and quantum polarization, Quantum information processing, Open quantum systems, Cavity and circuit QED, Quantum optics with neutrons, atoms, molecules, Quantum optics in condensed matter systems. The important feature of the workshop is bringing together the leading specialists in the fields of quantum optics and quantum information with the young researchers. This year the workshop was organized by the Royal Institute of Technology (Prof. Gunnar Björk) and Stockholm University (Prof. Ingemar Bengtsson and Prof. Mohamed Bourennane).

Základní údaje:

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

Zajímavé přednášky

T. Sowinski: ***One-dimensional extended Bose-Hubbard models with local three-body interactions***
The presentation of Dr. Sowinski from Institute of Physics of the Polish Academy of Sciences in Warsaw and Institute for Photonics in Barcelona was dedicated to study of the extended Bose-Hubbard (BH) model with pure three-body local interactions using the Density Matrix

Renormalization Group approach. 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 author studies the ground state phase diagram of a particular extension of the standard BH model, assuming that mutual interaction between particles is of three-body origin. Due to perturbative changes of single-particle wave functions, the effective three-body terms are attractive (for a repulsive gas) [2]. Neglecting the two-body interactions author estimates the values of the critical tunneling for which the system undergoes the quantum phase transition from insulating to superfluid phase. The author also shows that stability of insulating phases, in contrast to standard BH model, is enhanced for larger fillings.

Literatura:

[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***

Dr. Altinas from the Department of Physics, Abant Izzet Baysal University in Turkey investigated the dynamics of atom-field entanglement for a system composed of two atoms resonantly coupled to a single mode leaky cavity field waiving the standard rotating wave approximation. Author consideres Rabi model, which describes the interaction of a two-level atom (a qubit) with a quantized single mode cavity field (a harmonic oscillator) [1]. In the rotating wave approximation (weak coupling regime) such model reduces to the Jaynes-Cummings model. Instead the author considers interaction between and atom and a cavity in the strong-coupling regime using the recently derived Lindblad master equation for the strong-coupling regime [2]. Using this approach author investigates the dynamics of atom-field entanglement for a system composed of two qubits resonantly coupled to a single mode leaky cavity field. The strong atom-field interaction was found to induce atom-field entanglement in the steady states contrary to the weak-coupling.

Literatura:

[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

V. Usenko and R. Filip, *Continuous-variable quantum key distribution over fading channels.*

The oral presentation was given at the conference and the recent theoretical results as well as experimental tests performed in collaboration with Max-Planck Institute for the Science of Light in Erlangen were reported. The talk addressed the issue of establishing the secure quantum key distribution over atmospheric channels were transmittance is fluctuating due to the atmospheric turbulence. The effect of a fluctuating channel was derived in terms of the covariance matrix, which enables the security analysis of the respective Gaussian protocol. The bounds on the channel flcutauations were thus derived for the coherent-state protocol and the scheme was shown potentially vulnerable to the strong fluctuations of transmittance. Such negative effect was shown to be possible to compensate either using spatial filtering (within the framework of the fading caused by beam wandering [1]) or using post-selection combined with the proper channel estimation. In the latter case optimized modulation and optimal post-selection enable to double the tolerable excess noise in the channel. The stability of the result

was studied and shown against the finite-size effects as well as against imperfect channel estimation [2]. The presentation was followed by discussions with Dr. Karpov from University of Brussels, Dr. Genoni from Imperial Colledge, London, with Dr. Chekhova from MPI in Erlangen and others.

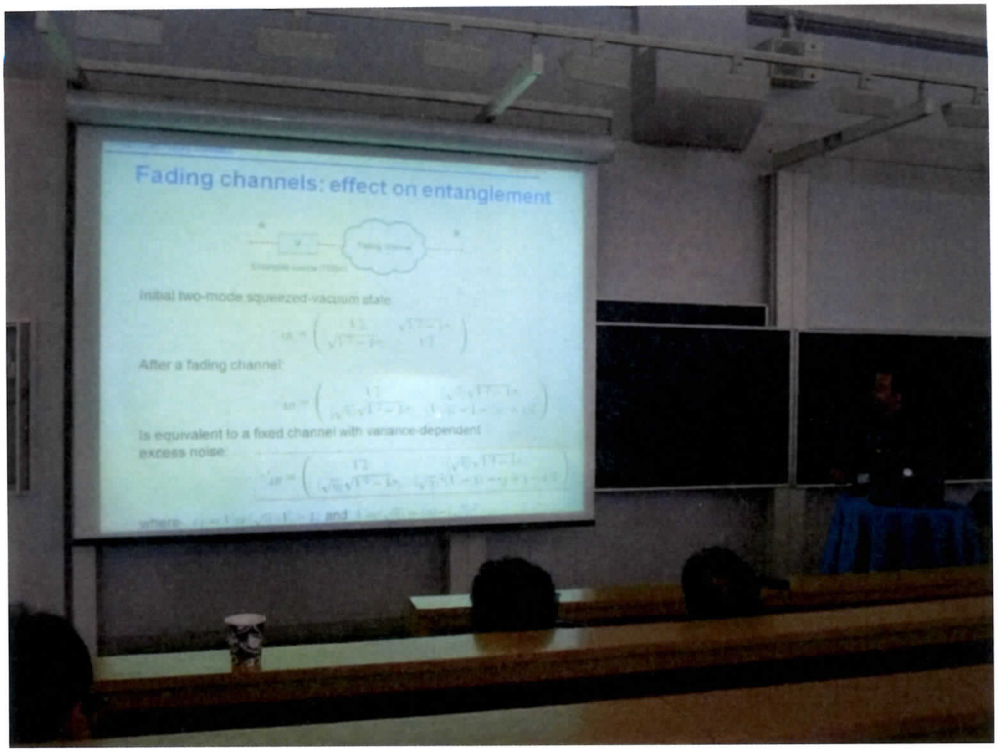
Mezinárodní vědecká spolupráce

The pariticpation in the conference was successfully used to expand the contacts and scientific collaboration with the world renowed groups working in the fields of quantum optics and quantum information.

The running project was discussed with Dr. Chekhova from MPI Erlangen.

The conference participants were informed about the project of International Center for Information and Uncertainty, supported by the OP VK program.

Fotografická dokumentace



Dr. Usenko during his presentation at CEWQO'2013.

Vladyslav Usenko, Ph.D.