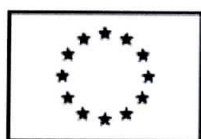


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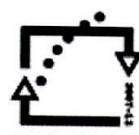
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EVROPSKÁ UNIE



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: SPIE Photonics Europe 2014
Datum konání: 14.4. - 17. 4. 2014
Místo: Brusel, Belgie
Účastník konference: Mgr. Vladyslav Usenko Ph.D.

Stručný popis konference:

SPIE Photonics Europe is the series of the meetings, organized by SPIE (The International Society for Optical Engineering) in order to bring together scientists working in the field of Optics. It includes multiple sub-conferences on the topics such as Micro/Nano Technologies, Organic Photonics, Bio- and Neurophotonics, Highly Integrated and Functional Photonic Components, Advances in Laser and Amplifier Technologies, Photonics in Industrial Applications and Quantum Optics. The plenary talks were given by the leading researchers in the fields of Optics and Photonics such as John M. Dudley (Univ. de Franche-Comté), Pramod Rastogi (Swiss Federal Institute of Technology), Brian C. Wilson (Princess Margaret Cancer Centre and Techna Institute, Univ. of Toronto), John E. Sipe (Univ. of Toronto), Frank Koppens (ICFO The Institute of Photonic Sciences, Spain), Michal Lipson (Cornell Univ.) and others.

Základní údaje:

Počet účastníků: >1200
Počet přednášek: >800
Počet posterů: ~400

Zajímavé přednášky

German J. de Valcarcel: *Optical four-wave mixing and generation of squeezed light in an optomechanical cavity driven by a bichromatic field.*

The presentation of prof. de Valcarcel from Department of Optics of University of Valencia was dedicated to study of the generation of quadrature and intensity optical squeezing in optical cavities [1]. The authors propose to use a new type of modulated driving consisting of two components, whose beat note is not related to the frequency of the mechanical oscillator.

The authors show that a threshold exists for the input power at which the (non-injected) mid-frequency becomes generated due to four-wave mixing of the drive frequencies. At that threshold (which is a static bifurcation, unlike the parametric instability of the mirror motion) high levels of optical squeezing –ideally perfect– are predicted, which do not depend critically on the temperature of the device.

Literatura:

[1] J. Laurat, T. Coudreau, N. Treps, A. Maitre, C. Fabre, Phys. Rev. A 69 033808 (2004)

Roman L. Kolesov: *Single rare-earth ion in a crystal as a spin qubit*

Dr. Kolesov from the Universitat Stuttgart and Stuttgart Research Center of Photonic Engineering presented the study of the experimental results on high-fidelity optical initialization, efficient coherent manipulation, and optical readout of a single electron spin in rare-earth doped YAG crystal. The research is motivated by the potential use of such physical systems as the quantum memories for storage of optical information. Strong hyperfine coupling to aluminium nuclear spins suggests that cerium electron spins can be exploited as an interface between photons and long-lived nuclear spin memory. The authors shown that combined with high brightness of rare dope emission and a possibility of creating photonic circuits out of the host material, this makes cerium spins an interesting option for integrated quantum photonics.

Literatura:

[1] Kolesov, R., Xia, K., Reuter, R., Sthr, R., Zappe, A., Meijer, J., Hemmer, P.R., and Wrachtrup, J. Optical detection of a single rare-earth ion in a crystal. Nature Communications 3, 1029 (2012)

Vlastní prezentace

Vladyslav C. Usenko, Laszlo Ruppert, Radim Filip, *Towards continuous-variable quantum key distribution with multi-mode entangled states of light.*

The presentation was dedicated to the proposal of the continuous-variable (CV) quantum key distribution protocol (QKD) [1] based on the multimode homodyne detection and multimode entangled states of light. The case of the multi-mode measurement of the single-mode entangled source, which effectively means additional security-breaking side-channel loss prior to detection, was studied. Moreover, the entangled states may be as well multi-mode, which is observed in particular in the case of the bright squeezed vacuum states of light [2]. In this casethe positive effect of the mode balancing on the side of the source or mode selection on the side of detection is shown. Finally, the case of the heavily multi-mode states with fluctuating energy per mode was considered and the positive effect of increasing number of the modes was shown, which leads to averaging of the Gaussian entanglement of the states and stabilization of the key rate. The result opens a promising pathway towards the realization of CV QKD with the multi-mode states of light. The presentation was followed by discussions with Paolo Traina (Istituto Nazionale di Ricerca Metrologica, Italy), Sara Ducci (Univ. Paris 7-Denis Diderot, France) and Thomas Durt (Ecole Centrale Marseille, France) and others.

[1] C. Weedbrook, S. Pirandola, R. Garcia-Patron, N. J. Cerf, T. C. Ralph, J. H. Shapiro, and S. Lloyd, Rev. Mod. Phys. 84, 621 (2012).

[2] T. Iskhakov, M. Chekhova, G. Leuchs, Phys. Rev. Lett. 102, 183602 (2009)

Mezinárodní vědecká spolupráce

The participation in the SPIE Photonics Europe 2014 conference was used to successfully enforce and expand the contacts and scientific collaboration with the world renowned groups working in the fields of quantum optics and quantum information.

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 SPIE Photonics Europe 2014.

Vladyslav Usenko, Ph.D.