evropský sociální fond v ČR
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 stáži

Datum konání stáže:	27.07.2013 – 17.08.2013
Navštívené pracoviště:	Danish Technical University, Lyngby, Dánsko
Zahraniční garant:	prof. Ulrik Andersen
Účastník stáže:	Vladyslav Usenko, Ph.D.

Stručný popis navštíveného pracoviště

Danish Technical University (DTU, founded in 1829) is one of the Europe's leading engineering institutions, and the best engineering university in Scandinavia (according to the Times Higher Education ranking), it is also the first technical university in Europe in terms of the number of publications. DTU has very strong international scientific collaboration and education with half of the PhD students being from abroad as well as the a third of the stuff. The Quantum Physics and Information Technology (QIPT) section of Physics Department of DTU aims at designing novel materials and processes for information technology and sensing. The section participates in numerous international projects, including EU-financed, as well as Danish projects. The section leader, Prof. Ulrik Andersen, is very active in the field of quantum optics and quantum information with the outstanding results, being regularly published in top-ranked international peer-reviewed journals. Besides the group leader the stuff of the section includes 2 associate professors, 5 post-docs and several Ph.D.-students.

Průběh stáže

The aim of the visit was the joint scientific research in the field of continuous-variable Gaussian quantum key distribution, which has its goal in the development and optimization of protocols for secure distribution of a cryptographic key. In particular, the visit was dedicated to the investigation of the possibility to completely decouple a potential eavesdropper (to which the interaction of the signal with the environment is attributed) from the secure quantum channel, i.e. to completely cancel the information leakage. The theory was earlier developed in Olomouc in collaboration with doc. R. Filip, while during the visit the experimental results of the preparation of the properly weakly modulated squeezed states and their measurements were discussed. The experimental work was performed by the Master student, Mr. Christian Jacobsen under the supervision of Prof. Ulrik Andersen and became the continuation of the experiment, started by Dr. Lars Madsen (now at the University of Queensland, Australia). The experimental data was obtained in the regime of the strong

channel attenuation, in which case the purification by an eavesdropper had to be assumed due to impossibility of direct measurement of the channel output. The results were analyzed and confirmed the theoretical predictions, while some more measurements must be carried on to obtain smoother dependencies and fully demonstrate the effect of decoupling a quantum signal from the environment. The corresponding publication was prepared from the theoretical side (with the new contribution demonstrating stability of the information decoupling against various types of noise) and after addition of the experimental results it is scheduled for submission before the end of the year 2013.

During the visit the talk entitled "Continuous-Variable Quantum Key Distribution: Achievements and Issues" was given by Dr. Usenko at the QIPT group meeting, attended by the group staff. The talk covered an introduction to the continuous-variable quantum cryptography, practical issues, several accomplished projects, and challenges which still exist in the field. During the talk the group was also informed about the activity of the International Center for Information and Uncertainty, supported by the OP VK program.

Publikace rozpracované během stáže

The experimental results are currently being prepared for the publication, scheduled to submission in 2013.

Navázání kontaktů

The visit led to further intensification of the collaboration between the Department of Optics of the Palacky University in Olomouc and the experimental QIPT group in Lyngby. The fruitful contacts were established also with the younger researcher Mgr. Christian Jacobsen, who had recently become a Ph.D. student at the QIPT group and will continue the research in the field of continuous-variable quantum information and communication.

Shrnutí stáže

The visit achieved its goals, the scientific collaboration with one of the leading European institutions in the field of quantum optics and quantum information was successfully continued and intensified. The new knowledge on the current research trends in the field of experimental quantum information was obtained and will be further disseminated to the target group within the scientific seminars.

Fotografická dokumentace

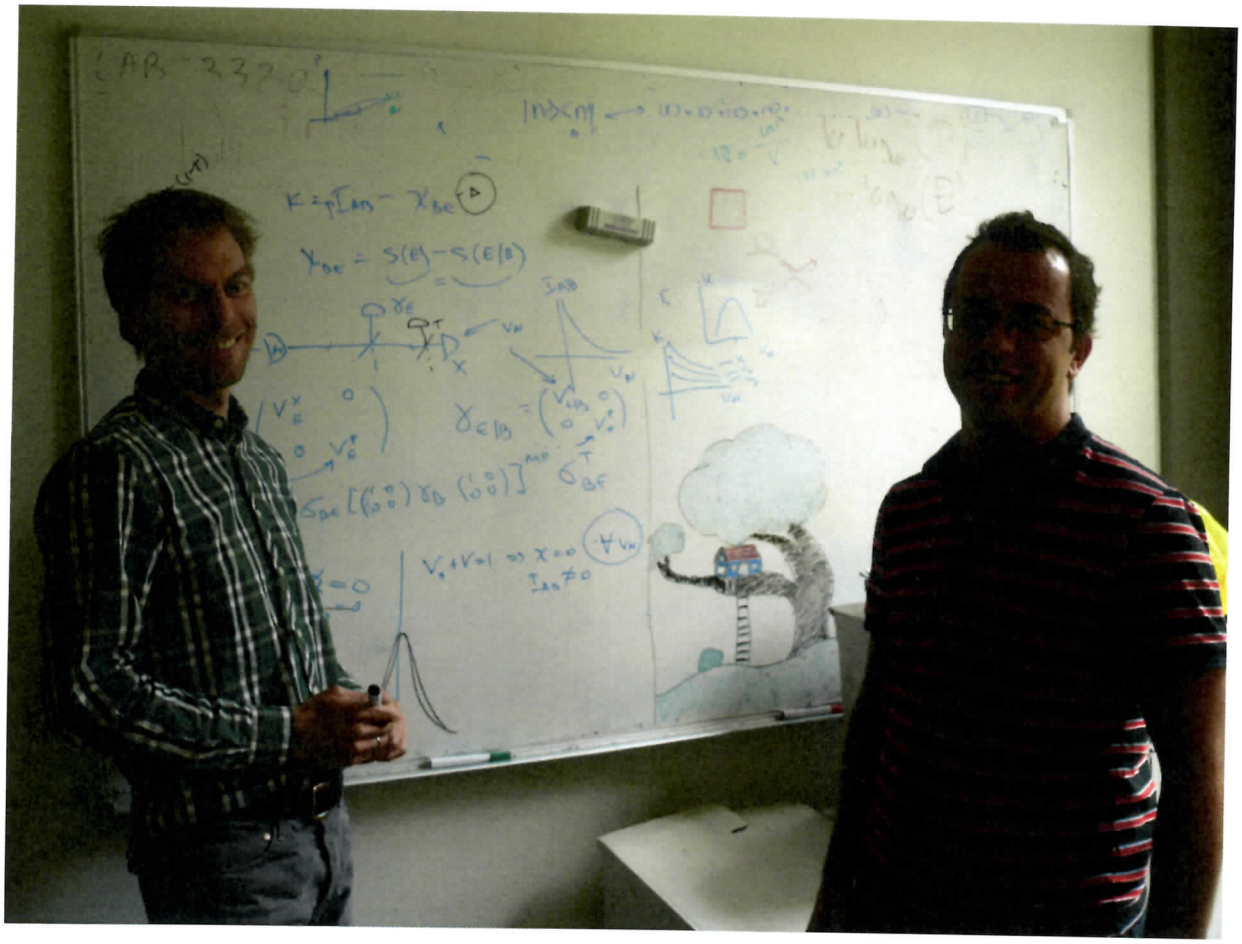

Photo taken during the scientific discussion within the stay, depicted are and Dr. Usenko (right) and Prof. Andersen (left).

Photo taken during the scientific presentation within the stay, made by Dr. Usenko in the group of Prof. Andersen.

Vladyslav Usenko, Ph.D.