International Centre for Theory of Quantum Technologies

Uniwersytet Gdański

Christmas Seminar
14.12.2023 – 15.12.2023

Venu:

Department of Mathematics, Physics and Informatics
Wita Stwosza 57
80-308 Gdańsk
lecture hall: 1.14

zoom meeting
https://zoom.us/j/98888294831?pwd=ZUIvT3RRUXZYQkdUc0lKdlNnYmxPZz09
Meeting ID: 988 8829 4831, Access code:9HzGDQ

14.12.2023
Thursday

09:00 – 10:30	**Prof. Stephen Walborn** Universidad de Concepcion (Chile) **Open seminar**	**Photonic Quantum Information with Multicore Fiber Technology.** **hybrid form**
10:30 – 11:00	**coffee break**	
12:00 – 12:30	**Prof. Gustavo Lima** Universidad de Concepcion (Chile) **Open seminar**	**Experimental Implementation of Generalized Measurements.** **hybrid form**
12:30 – 13:00	**coffee break**	
13:00 – 14:30	**Prof. Lucas Celeri** Universidade Federal de Goiás (Brazil)	**Indefinite causal order: Fundamental aspects and some applications.** **hybrid form**

15.12.2023
Friday

12:00 – 13:00	**Dr Katarzyna Siudzińska** Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus University (Poland)	**Improving communication properties of quantum channels using noise.**
13:00 – 13:30	**coffee break**	
14:00 – 15:00	**Prof. Maciej Wojtkowski** International Centre for Translational Eye Research (ICTER) Institute of Physical Chemistry, Polish Academy of Science (Poland) **Open seminar**	**Control of spatial and temporal coherence of light used for imaging in scattering media.**
15:00 – 15:30	**coffee break**	

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Abstract

Dr Katarzyna Siudzińska

For the purposes of quantum communication, it is crucial to understand how to reliably transmit, manipulate, and protect information when transmitted over a noisy quantum channel. The unavoidable impact of noise often proves detrimental to quantum tasks. To reduce information loss, error correction, mitigation, or suppression techniques are used. However, there is an alternative approach, where instead of reducing the effects of noise, it is used as a quantum resource. In this presentation, I show how decoherence and classical noise can be used to improve the communication properties of Pauli channels, generalized Pauli channels, and phase-covariant channels. By introducing noise at the level of dynamical maps or master equations, I obtain e.g. increased classical capacity of quantum channels, reduced deformation of the output states, and prolonged lifetime of quantum entanglement.

Abstract

Prof. Maciej Wojtkowski

As part of our work, we developed a new way to describe the effect of spatial light coherence control on imaging in turbid media. As a result, we developed a new tool for imaging biological objects, which we called spatial-temporal optical coherence tomography (STOC-T). In particular, the removal of optical field perturbations caused by optical inhomogeneities of the medium (biological tissue) allows us to image the deeper layers of the sample non-invasively. This unique feature also allows us to quantitatively analyze the dynamics of blood flow in the deep layers of the sample. The new STOC-T method for imaging biological structures of the eye enables in-vivo imaging with microscopic accuracy, but the final imaging results require additional iterative geometric aberration correction algorithms to obtain sharp images.