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# Seminar

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- **SPEAKER**

Dr. Artur Czerwinski (Institute of Physics, Nicolaus Copernicus University)

- **TITLE**

Opportunities and challenges of optical communications

- **ABSTRACT**

The talk will be divided into two parts. In the first one, time-bin encoding will be presented as an opportunity for future advancement in optical communications. In the latter part, atmospheric turbulence will be discussed as a limiting factor for optical key distribution.

Information can be encoded on single photons by exploiting different degrees of freedom. In particular, the temporal mode appears promising for future applications. First, I will introduce a comprehensive theoretical framework for encoding quantum states in the time domain. Next, I will demonstrate an efficient method for quantum state tomography of time-bin qudits. Then, a source of time-bin-entangled photon pairs will be presented along with a thorough analysis of entanglement quality.

In the second part of this talk, I will present an analysis of the amount of secret key that can be obtained using intensity modulation/direct detection optical key distribution for a free-space optical link established between an optical ground station and a low-earth orbit satellite. I consider a downlink communication that involves the effects of atmospheric turbulence and leads to random changes in the transmittance of the channel. In the hard decoding and direct reconciliation regime, I quantify the amount of secret key depending on the noise scenario and efficiency of reconciliation codes.

- **DATE AND VENUE**

Aug 23, 2023 (Wednesday, 3:00 p.m. - 4:00 p.m.)

- **LANGUAGE**

English

- **INVITED BY**

Professor Tai Hyun Yoon