



Special Course

Quantum Cryptography:

100% secure communication

The aim of this project is to build an experimental setup for EPR-Quantum Key Distribution to demonstrate 100% communication

Can we use quantum mechanics to achieve communication 100% secure against eavesdropping? In this project, you will develop an experimental setup to send encrypted messages using EPR Quantum Key Distribution. We have a source of entangled photons (EPR states) and we would like to use these to establish a secure communication between two points (Alice and Bob). In order to do this, the concept of quantum key distribution and quantum mechanics are used to ensure the sharing of a secret key between Alice and Bob. Multiple existing protocols will be studied and one of them will be chosen for implementation in our lab, starting from scratch.



Goals of the project (which may be modified according to the interests of the student):

- understanding pro and cons of different EPR-QKD protocols for implementation in our lab
- design and build a robust setup for the chosen protocol, starting from our EPR source
- demonstrate EPR-100% secure communication for the first time at DTU Fotonik

Skills/knowledge acquired through the project:

EPR photon sources, parametric-down-conversion, quantum key distribution protocols with focus on EPR, secure communication requirements, hands-on experience of photonics lab work, designing and building of an experimental setup

Background requirements:

Knowledge of quantum mechanics (e.g. from 10112 Advanced Quantum Mechanics).

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Reference:

[1] [Quantum key distribution is the future for secure comms](#) – Computerweekly.com