

Allgemeines Physikalisches Kolloquium

Donnerstag, 30.06.2022 um 16 Uhr c.t.

Prof. Pepijn Pinkse

University of Twente



© University of Twente

Quantum Authentication, Quantum Communication, and Quantum Information Processing

Quantum technology comes in many flavors. In this talk I will discuss some results from the AQO group at the UT in the areas of quantum authentication, authenticated communication and quantum information processing with integrated photonics:

A physical unclonable key (PUK) is a unique key which cannot be physically copied with existing technology. Multiple-scattering samples form good PUKs. We have demonstrated authentication by quantum-secure optical readout of a PUK [1] and more recently, we have devised a quantum communication scheme based on PUKs [2]. In order to investigate the limits of state-of-the-art nanofabrication techniques, we started making multiple-scattering media by direct laser writing, as illustrated in the figure. A new class of PUKs we realized in the form of complex integrated photonic circuits.

For the purpose of achieving and exploiting a quantum advantage for computational tasks, scalable multiphoton interference with extreme programmability and ultralow loss is required. We believe the best way for that purpose is large-scale integrated photonics, which we are pursuing together with UT spin-off Quix Quantum. A programmable integrated photonic processor [3] recently allowed us to demonstrate quantum photodynamics [4], an indistinguishability witness [5] and an analog simulation of open scattering channels [6].