



SFB/TRR 21 - Colloquium

13. Januar 2017, Stuttgart

## Professor Dirk Englund

(Massachusetts Institute of Technology)

### Photonic Integrated Circuits for Quantum Communications

Abstract: Photonic integrated circuits (PICs) have become increasingly important in classical communications applications over the past decades, including as transmitters and receivers in long-haul, metro and datacenter interconnects. Many of the same attributes that make PICs attractive for these applications — compactness, high bandwidth, and the ability to control large numbers of optical modes with high phase stability — also make them appealing for quantum information processing. The first part of this talk will review our recent progress in adapting one of the leading PIC architectures—silicon photonics—for various quantum secure communications protocols. The second part of the talk will consider how photonic integrated circuits technology can extend the reach of quantum communications through all-optical and memory-based quantum repeater protocols. Beyond quantum communications, these programmable PICs are also finding application in photonic quantum simulation, BosonSampling, and classical applications including in artificial neural networks for machine learning.

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SFB/TRR 21 Control of quantum correlations in tailored matter  
Stuttgart, Ulm, Tübingen