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ROYAL INSTITUTE
OF TECHNOLOGY



*Lectures on
Quantum Communication and Quantum Cryptography
by*

Prof. Anders Karlsson (2004 European Descartes Prize winner)

Lecture 1

Date: 11 December, 2006 (Monday)
Time: 10:00am-11:30am
Location: Conference Room (Rm 214), East Building # 5,
Centre for Optical & Electromagnetic
Research/JORCEP, Zijingang campus,
Zhejiang University

*Quantum Information and Communication Technologies: An
introduction*

Professor Anders Karlsson
Quantum Photonics at the Department of Microelectronics and Applied Physics,
Royal Institute of Technology (KTH)

Abstract

In the last ten, fifteen years quantum information physics and technologies has emerged as a new and extremely flourishing area of research with major support worldwide. The basic idea is that the control and manipulation of individual quantum systems allows for the construction of devices and computational algorithms with improved, or even totally new properties that goes way beyond devices based only on classical concepts. In this first lecture I will give an introduction to the area, and illustrate it with applications such as quantum cryptography, quantum teleportation and quantum computing.

Lecture 2

Date: 13 December, 2006 (Wednesday)
Time: 10:00am-11:30am
Location: Conference Room (Rm 214), East Building # 5,
Centre for Optical & Electromagnetic
Research/JORCEP Zijingang campus,
Zhejiang University

Quantum Communication and Quantum Cryptography using Entangled State Light Sources.

Professor Anders Karlsson
**Quantum Photonics at the Department of Microelectronics and Applied Physics,
Royal Institute of Technology (KTH)**

Abstract

Quantum communication deals with the transmission and manipulation of quantum bits (quantum states) encoded on individual photons or special multi-photon states. Entangled quantum states has been of particular interest in the recent years. These are multi-photon states, whose (non-local) quantum correlations extend beyond the correlations permitted by classical physics. Such non-local quantum states, originally predicted by Schrodinger, led Einstein in a famous paper (Einstein, Podolsky and Rosen 1935) to predict that quantum mechanics cannot be a complete theory. Today, thanks to optical technologies, it is well established that the entangled quantum state correlations are real, and entangled states has emerged as a key enabler in the flourishing area of quantum information and communication technologies. In this talk I will present in detail how entangled quantum states can readily be generated in the lab using non-linear optics. I will describe recent works for achieving narrowband bright entangled states suitable for quantum communication in telecom systems. I will describe work on quantum cryptography done at KTH, Sweden, as well as review work done in the European projects SECOQC and IST-QuComm on quantum cryptography and the teleportation of quantum states over several tens of kilometer in optical fibers or free space.

About the Speaker

Anders Karlsson is Professor of Quantum Photonics at the Department of Microelectronics and Applied Physics, Royal Institute of Technology (KTH), Stockholm, Sweden. He has been a visiting researcher at NTT Basic Research Laboratory, Stanford University, and Nihon University. He was the chairman of the European COST 268 "Wavelength scale photonics" project. During 1999-2003 he was the general project leader of the IST QuComm "Long Distance Photonic Quantum Communication" project, which in 2004 was awarded the European Descartes Prize for "excellence in collaborative research". He was the KTH project leader of the European ACTS Vertical, IST FP PCIC, TMR Microlasers, IST SECOQC (ongoing) and IST QAP (ongoing) projects. He is the holder of an INGVAR (individual grant for advancement of research leaders) from the Swedish foundation for strategic research (SSF).

ALL ARE WELCOME!

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