SONDERSEMINAR
LMU/MPQ

am: **Freitag, 28. Mai 2010**

Uhrzeit: **10:00 Uhr s.t.**

spricht: **Professor Shigeki Takeuchi**
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Thema: **Photonic Quantum Circuits & Application**

Ort: **Fakultät für Physik/LMU**
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gez. Prof. T.W. Hänsch

Abstract

Photonic Quantum Circuits & Application

In this talk, we present our recent demonstration of `an entanglement filter'[1]. The ability to filter quantum states is a key capability in quantum information science and technology, where one-qubit filters, or polarizers, have found wide application. Filtering on the basis of entanglement requires extension to multi-qubit filters with qubit-qubit interactions. We demonstrate an optical entanglement filter that passes a pair of photons if they have the desired correlations of their polarization. Such a device has been proposed for photonic qubits[2], however, the technical requirements to build such a device, an optical circuit with two ancillary photons and multiple quantum gates, requiring both quantum interference and classical interference in several nested interferomters, have been lacking. We demonstrate an entanglement filter by combining two key recent technological approaches---a displaced-Sagnac architecture[3] and partially polarizing beam splitters. The entangling capability of the filter was verified, distinguishing it from classical ones.

[1] R. Okamoto, J. O'Brien, H. F. Hofmann, T. Nagata, K. Sasaki and S. Takeuchi, Science 323 (2009) 483.
[2] H. F. Hofmann and S. Takeuchi, Phys. Rev. Lett. 88, 147901 (2002).
[3] T. Nagata, R. Okamoto, J. O'Brien, K. Sasaki and S. Takeuchi, Science 316(2007) 726.