



# Master's Thesis Defense Electro-Optics and Photonics

Wednesday, May 29, 2019, 11 a.m., Fitz Hall 568

All are welcome to attend.

## Quantum Nonlinear Optics

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### Abstract

Quantum computing research has been around for several decades, since it was first proposed by Richard Feynman. Many efforts have been made to utilize quantum systems in creation of new computing devices in the recent years. One of the essential tools used for characterization and manipulation of optical quantum systems is a Hong-Ou-Mandel (HOM) Interferometer. It is used in this work to provide information about propagation, distortion and degree of indistinguishability of single photons.

This work can be also seen as the transition from the classic nonlinear optics to the quantum nonlinear optics. We provide a necessary basic nonlinear background, such as phase matching and parametric down conversion process. Then we introduce the phenomenon of the HOM effect and HOM dip on the base of the photon entanglement and photon antibunching process.

The HOM interferometer is also used to measure the correlations between two coherent photon sources. Single photons generated by parametric down conversion are tailored through aggressive filtering techniques to be identical in their spectral, temporal and polarization profiles. The visibility of the correlation photons is a judgement to measure whether the photons can be distinguished or not.

This work attempts to provide better understanding of single photon interactions by SPDC process through use of an HOM interferometer.

Key words: Parametric down conversion, HOM interferometer, HOM dip and visibility.