

3 Project proposals by Prof. Thomas Jennewein:

1) Optimal SPDC squeezing for satellite QKD:

Given a certain link loss (ca. 40dB) between ground and space, an entangled photon source based on SPDC will have an optical squeezing parameter. Find the optimal squeezing, given the detectors have a timing uncertainty of 1 ns, and dark counts of 0, 200 cps, 500cps, 1000 cps.

Literature: Catherine Holloway, John A. Doucette, Christopher Erven, Jean-Philippe Bourgoin, and Thomas Jennewein. Optimal pair-generation rate for entanglement-based quantum key distribution. PHYSICAL REVIEW A, 87(2):022342, (2013).

2) SPDC as an optimal quantum cloner:

Show that SPDC with seeding input can be a quantum cloner for polarized photons. What is the Fidelity of the output?

Literature: C. Simon, G. Weihs, A. Zeilinger. Optimal quantum cloning via stimulated emission. Phys. Rev. Lett., 84:2993–2996, (2000).

3) $g(2)$ and higher of SPDC emission, thermal light sources:

Determine how much correlation could be obtained from a narrow band thermal light source, after splitting the beam into multiple paths (2, 3, 4) and looking for polarization correlation in the multiple-photon counts.

Literature: <http://arxiv.org/abs/0807.1725>, <http://arxiv.org/abs/1503.07369>