Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Semiconductor Waveguides for Correlated Photon Generation

DANIEL ROGERS, University of Maryland Chemical Physics Program, JOSHUA BIENFANG, National Institute of Standards and Technology, JULIUS GOLDHAR, Department of Electrical and Computer Engineering, University of Maryland, CHRISTOPHER RICHARDSON, Laboratory for Physical Science, University of Maryland, CARL WILLIAMS, CHARLES CLARK, National Institute of Standards and Technology — The next generation of quantum cryptography will benefit from a fast and practical source of entangled photon pairs. Current methods of generating entangled photon pairs, whether in nonlinear crystals or exotic microstructure optical fibers, pose significant challenges to integration into fieldable quantum communications systems. In order to meet the demands of speed and practicality, nonlinearities in semiconductor waveguides are being investigated as sources of correlated and ultimately entangled photons. These devices offer the advantages of having a fast nonlinear response and being able to couple to standard optical fibers. We investigate the feasibility of using a bulk AlGaAs waveguide and birefringent phase matching to generate correlated photon pairs compatible with silicon detectors. This source is potentially useful for free-space and fiber-optic quantum key distribution, as well many other applications such as correlated photon metrology and squeezing experiments. We consider the effects of loss and two-photon absorption and show that birefringent phase matching has significant advantages over tailored group velocity dispersion in filtering and Raman noise suppression.

Daniel Rogers
University of Maryland

Date submitted: 02 Feb 2007 Electronic form version 1.4