Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Free-Space Quantum Cryptography in a Hydrogen Fraunhofer Window DANIEL ROGERS[1], JOSHUA BIENFANG, ALAN MINK, BARRY HERSHMAN, ANASTASE NAKASSIS, XIAO TANG, LIJUN MA, DAVID SU, CARL WILLIAMS, CHARLES CLARK, National Institute of Standards and Technology — Quantum key distribution (QKD) has shown the potential for the production of cryptographic key for ultra-secure communications. The performance of any QKD system is ultimately limited by the signal to noise ratio on the single-photon channel, and over most useful communications links the resulting in key rates are impractical for performing continuous one-time-pad encryption of today's broadband communications. We have adapted clock and data recovery techniques from modern telecommunications practice to increase the repetition rate of a free-space QKD system by roughly 2 orders of magnitude over previous demonstrations. We have also designed the system to operate in the H-α Fraunhofer window at 656.28 nm, where the solar background is reduced by roughly 7 dB. To achieve high repetition rates this system takes advantage of silicon single-photon avalanche photodiodes with < 50 ps timing resolution and high detection efficiency in the visible region. This free-space QKD system is designed to operate at a repetition rate of 2.5 GHz. We have identified scalable solutions for delivering sustained one-time-pad encryption at 10 Mbps, thus making it possible to integrate quantum cryptography with first-generation Ethernet protocols.

[1]also with the University of Maryland Chemical Physics Program

Daniel Rogers
National Institute of Standards and Technology

Date submitted: 08 Feb 2006 Electronic form version 1.4