Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Recent Results in Photonic Quantum Computations, Simulations and Quantum Networks PHILIP WALTHER, University of Vienna — The applications of photonic entanglement manifold and reach from quantum communication [1] to quantum metrology [2] and optical quantum computing [3]. The advantage of the photon's mobility makes optical quantum computing unprecedented in speed, including feed-forward operations with high fidelity [4]. During the last few years the degree of control over photonic multi-particle entanglement has improved substantially and allows for not only overcoming the random nature of spontaneous emission sources [5], but also for the quantum simulation of other quantum systems. Here, I will also present the simulation of four spin-1/2 particles interacting via any Heisenberg-type Hamiltonian [6]. Moreover, recent experimental and theoretical progress, using the concepts of measurement-based quantum computation, indicates that photons are best suited for quantum networks. I will also present present results for the realization for such a client-server environment, where quantum information is communicated and computed using the same physical system [7]. References: [1] PRL 103, 020503 (2009); [2] Nature 429, 158 (2004); [3] Nature 434, 169 (2005); [4] Nature 445, 65 (2007); [5] Nature Photon 4, 553 (2010); [6] Nature Physics 7, 399 (2011); [7] in press.

Philip Walther
University of Vienna

Date submitted: 11 Nov 2011 Electronic form version 1.4