Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Optical Engineering for Quantum Computing Over the Optical Frequency Comb MORAN CHEN, OLIVIER PFISTER, University of Virginia — The optical frequency comb (OFC) of a single optical parametric oscillator (OPO) has shown a spectacular, if theoretical, scalability potential as a continuous-variable one-way quantum register. Indeed, an arbitrarily large, square-grid cluster state, suitable for universal quantum computing, can in principle be generated in one fell swoop in the OPO, by use of a triply concurrent nonlinear crystal (already demonstrated) and a 15-mode pump. Here we present a precise and feasible implementation plan for this complex pump spectrum, using single-sideband, suppressed-carrier (SSB-SC) electrooptic modulation. Another requirement is the proper termination of the set of interacting entangled modes within the OFC. We show that OFC dispersion can be realistically managed, by use of microcavity OPO mirrors, so as to shift the frontier modes out of resonance and essentially annihilate their interaction. Solving these two "optical engineering" problems paves the way to the experimental realization of scalable cluster-state entanglement "over the rainbow."

Moran Chen
University of Virginia

Date submitted: 21 Nov 2010 Electronic form version 1.4