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Continuous-Variable Quantum Cluster-State Generation Using a Tapered Amplifier[1] ANDY BLACK, Middle Tennessee State University, MILLER EATON, Southern Illinois University, RAPHAEL POOSER, BEN LAWRIE, Oak Ridge National Laboratory - Quantum Information Science Group — Quantum computing promises to offer a more efficient means of solving classically taxing problems. Continuous-variable one-way quantum computing (QC) using cluster-states has the advantage of scalability over discrete-variable QC. Tapered amplifiers offer a relatively inexpensive and compact means to amplify an input seed light source at the expense of phase noise, which could contaminate the entanglement needed for one way QC. Using a tapered amplifier as a pump and probe source, we confirmed that the generation of entangled twin beams from four-wave mixing in a ^{85}Rb vapor cell is possible, first by measuring 4.0 +/- 0.1 dB of intensity difference squeezing followed by amplitude-difference (AD) and phase-sum (PS) quadrature squeezing. To generate the entangled state we use one ^{85}Rb vapor cell to create signal and local oscillator beams for homodyne detection. We observed phase sensitive noise in the AD and PS quadratures using vacuum signal input. Further, we observed approximately 2.0 +/- 0.1 dBm of squeezing in the PS and AD quadratures, leading to an inseparability value of I = 1.47 +/- 0.02. Values of I <2 indicate entangled states. Such a system could provide a compact, scalable resource state for one-way QC.

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