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Investigation of Losses in Four-Wave Mixing Squeezed Light Experiments[1] ASHAY PATEL, KEVIN JONES, Williams College, PAUL LETT, University of Maryland Joint Quantum Institute, JOINT QUANTUM INSTITUTE TEAM — Squeezed states are nonclassical states of light with noise in either their intensity or phase below the coherent state standard quantum limit. The noise properties of squeezed states can be used to improve the sensitivity of interferometers like LIGO. Furthermore, squeezed states are testbeds to study basic questions information. Our group produces intensity-difference squeezed, entangled twin beams through four-wave mixing in hot rubidium vapor. Since losses in this system leads to the introduction of random vacuum fluctuations that reduce the measured squeezing, our experiments are sensitive to minor losses. This project is an investigation of losses in the four-wave mixing setup in order to eliminate them and optimize the measured squeezing. I devised an improved, easily implemented scheme to heat the rubidium vapor cell to prevent metallic rubidium plating out onto the cell windows, causing loss. Furthermore, I designed, built, and ran preliminary tests on a low noise, balanced photodetector for use in the squeezed light experiments. The group tested potentially higher quantum efficiency photodiodes, which show promise to improve the measured squeezing in the four-wave mixing experiments.

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