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Four-wave Mixing in Hot Sodium Vapor Cells QIMIN ZHANG, SAESUN KIM, LOGAN NARCOMEY, ALBERTO MARINO, ARNE SCHWETTMANN, University of Oklahoma — Squeezed states of light have a wide range of applications in quantum-enhanced sensing, quantum information processing, and other quantum technologies. It has been shown that non-degenerate four-wave mixing (4WM) in a hot atomic vapor cell can be used to produce quantum correlated twin beams of light. In a 4WM process, two pump photons are absorbed and produce two correlated twin photons, called probe and conjugate. Many 4WM experiments have been done in Rb to generate quantum squeezed states of light. 4WM using Na is expected to be more difficult due to the smaller hyperfine splitting compared to Rb: 1.77 GHz for ^{23}Na and 3.04 GHz for ^{85}Rb. For Na in a hot atomic vapor, this causes the Doppler-broadened transitions between the ground states and the first excited states to overlap. We present our experimental progress towards 4WM in a double-Λ configuration on the Doppler-broadened D2 line of ^{23}Na. We characterize the dependences of the 4WM gain on the pump and the probe frequencies, intensities, and the angle between the pump and the probe beams. We also compare our experimental results with a semiclassical model by calculating the susceptibilities and solving the classical propagation equation for the twin-beam fields.

Qimin Zhang
University of Oklahoma

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