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Quantum phase tracking in a truncated SU(1,1) interferometer PRASOON GUPTA, University of Maryland, College Park, RORY W. SPEIRS, Joint Quantum Institute, University of Maryland, College Park, PAUL D. LETT, Joint Quantum Institute, UMD, NIST Gaithersburg, N/A N/A, N/A — We perform a phase tracking experiment in a truncated SU(1,1) interferometer. Here we track the phase of light inside the interferometer. We show the theoretical analysis of the improvement in the phase tracking error with the truncated SU(1,1) interferometer over what is classically possible using a coherent beam in a truncated version of a Mach-Zehnder interferometer. In our experimental setup, we build a truncated SU(1,1) interferometer by producing a two-mode squeezed light using a 4-wave mixing (4WM) process in a hot Rubidium vapor cell. We perform joint homodyne detection on the two-mode squeezed beams to get the phase information. Theoretically, we look at the improvement in the phase tracking error with the gain of the 4WM process, optical loss and the squeezing measured in the two-mode squeezed light. We use a Kalman filter to process the electrical signal from the joint homodyne detector and obtain the phase information. We feed this phase information back to the joint homodyne detector to track the phase of the two-mode squeezed light inside the truncated SU(1,1) interferometer.

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