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A novel variation on the SU(1,1) interferometer for phase sensing beyond the standard quantum limit[1] BONNIE L. SCHMITTBERGER, BRIAN E. ANDERSON, PRASOON GUPTA, TRAVIS HORROM, CARLA HERMANN-AVIGLIANO, Joint Quantum Institute, University of Maryland and NIST, KEVIN M. JONES, Williams College, PAUL D. LETT, NIST Quantum Measurement Division and Joint Quantum Institute, University of Maryland and NIST — The SU(1,1) interferometer is a quantum-enhanced phase measurement device that has gained a recent surge of theoretical interest. An SU(1,1) interferometer replaces the two beam splitters in a Mach-Zehnder with nonlinear optical processesthe first generates squeezed light for phase sensing, and the second recombines the beams for detection. We present a novel phase measurement device that is a variation on the SU(1,1) interferometer but is far simpler to build and operate in practice. Our truncated SU(1,1) interferometer removes the second nonlinear interaction but still theoretically achieves the same potential phase sensitivity as the full SU(1,1) interferometer. We demonstrate experimentally that our current device beats the standard quantum limit by approximately 4 dB. This device has applications in precision metrology, where there is a strong interest in reducing the uncertainty on phase measurements while operating at low optical powers.

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