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Characterization of Passively Stabilized Multi-Wavelength Interferometer[1] IAN CALL, JOSEPH CHAPMAN, University of Illinois at Urbana-Champaign, IAN MILLER, LightMachinery Inc., PAUL KWIAT, University of Illinois at Urbana-Champaign — In support of establishing satellite-to-Earth quantum communication channels, we have constructed a passively stable delay-line interferometer to facilitate phase-stable production and measurement of time-bin qubits in an environment subject to large temperature swings, non-trivial vibration, and severely limited maintenance access. This is accomplished using an INVAR case holding two interferometers displaced vertically, each using the same optics bearing separate optical coatings for the necessary mirrors and beamsplitters. We expect merging each set of optical components in this way will keep the relative pathlength difference due to vibration and thermal expansion to a minimum, eliminating the need for frequent fine-tuning. To test the phase stability in the presence of temperature and vibration fluctuations, we employ difference-frequency generation to convert between the lower and upper interferometers wavelengths (532 rightarrow 810 nm), thereby producing phase stable pulses created in the lower interferometer and measured in the upper one.

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Ian Call
University of Illinois at Urbana-Champaign

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