Abstract Submitted
for the TSF21 Meeting of
The American Physical Society

The Effect of Laser Power on the Fidelity of a Polarized State[1]

CORDELL MAZZETTI, ALEJANDRO VILLALOBOS, University of Texas at Austin — For experimentalists measuring polarization states using Quantum State Tomography, the fidelity of the measured state reflects the success in recreating an ideal state. Errors in alignment and collimation can drastically affect this fidelity. Another variable that can affect this fidelity is the intensity of light or, equivalently, the rate of photons sent into an experimental setup. Using an experimental setup with attenuated laser light that can prepare states of polarized light with fidelities of up to 0.99, we found that by varying the intensity of light, the fidelity ranged from 0.25 to 1.0. Our results showed that for a single-photon counter module capable of measuring up to 500,000 photons per second, with the dark count rate around 330 Hz, the photon count rate that yielded the best fidelities sat around 31000 to 94000 photons per second. The data we collected also showed that, as photon counts increased, the standard basis states, on average, maintained higher fidelities than mixed states but were more likely to have fidelities that fell below 0.5. This discrepancy was likely due to the large differences in horizontal and vertical components of the basis states as the single-photon counter modules became oversaturated.

[1]Dr. Brian La Cour and Gabriel Ko

Cordell Mazzetti
University of Texas at Austin

Date submitted: 22 Sep 2021 Electronic form version 1.4