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Construction of a Quantum Optics Laboratory for Detecting Single Photon Coincidence Counts JASON HARRINGTON, RYAN WIDEJKO, PRESTON ALEXANDER, R. SETHFIELD SMITH, Francis Marion University — The purpose of this research was to construct an experimental apparatus for performing undergraduate level quantum optics experiments. Specifically, our goal was to set up the equipment required for detecting coincidence counts of photons emitted from a 405-nm diode laser (pump beam). The process of spontaneous parametric down conversion was utilized to convert the 405nm pump beam into two 810nm signal and idler beams. Through the implementation of an Altera DE2 field programmable gate array, along with four single photon counting modules, real time viewing of the experimental data was performed. This experimental setup provides undergraduate students with the opportunity to perform a variety of interesting experiments, many of which are designed around the production of pairs of photons that are used to test predictions made by Quantum Theory. Some of these experiments include the Grangier experiment, single photon interference, the Quantum eraser, tests of local realism, and tests of entangled and mixed states.

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