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FPGA Photon Coincidence Counting with National Instruments

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Coincidence Counting Units (CCUs) based on Field Programmable Gate Arrays (FPGAs) allow the execution of single-photon quantum mechanics experiments (such as the Grangier experiment, or testing of single photon interference) at relatively low cost. However, implementing such systems on National Instruments FPGAs poses a unique design challenge due to the limitations of LabVIEW's dataflow-based high level synthesis engine. We present a detailed description of one such implementation using a National Instruments myRIO FPGA. Our system achieves 6.9 ns minimum guaranteed-distinguishable delay and 32.2 MHz peak coincidence counting rate with four input channels and simultaneous monitoring of all possible coincidence types. This low cost system offers a way to make single-photon quantum experiments accessible to a larger audience of students and professionals.

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