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Using FPGAs for Simultaneous Photon Counting Imaging of Multiple Focal Planes[1] ERICH HOOVER, ERIC CHANDLER, JEFF FIELD, KRAIG SHEETZ, RAMÓN CARRILES, JEFF SQUIER, MOABC, CENTER FOR MICROINTEGRATED OPTICS FOR ADVANCED BIO-IMAGING AND CONTROL TEAM — Photon counting detection has been shown to provide significant signal-to-noise improvements in multi-photon microscopy. However, due to the time scales involved, it is non-trivial to assemble the necessary electronics to process PMT analog voltage signals into an image. By instead building the necessary logic inside of a Field Programmable Gate Array, photon counting imaging becomes tractable. This method also easily permits extending beyond simple 2D imaging into de-multiplexing data obtained from multiple focal planes nearly simultaneously. Given sufficient hardware, such a system can also be used to stream image data back to a PC and record video from each focal plane. Since imaging with a multi-photon microscope typically involves signals with repetition rates in the hundreds of megahertz, such imaging will not succeed without attention to seemingly minor details in the circuit design. This talk will present our photon-counting circuit design within the context of our imaging system.

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