Abstract: Localizing photon arrivals with high spatial (megapixel) and temporal (sub-nanosecond) resolution would be transformative for a number of applications, including single-molecule super-resolution fluorescence microscopy. Here, the Data Processing Field Programmable Gate Array (FPGA) is developed as an ultra-fast computational platform built on an FPGA for a microchannel plate (MCP)-photomultiplier tube (PMT) based single-photon counting camera. Each photon is converted by the MCP-PMT into an electron cloud that generates current pulses across a 50x50 cross-strip anode. The Data Processing FPGA executes a massively parallel center-of-gravity coordinate determination algorithm on the digitized current pulses to determine a 2D position and time of arrival for each charge cloud. The coordinates are finally relayed to a computer via a Gigabit Ethernet link. The system achieves a local photon throughput of 1.04 MHz. If photons arrive continuously with an average spacing of 1.5 µs across a 10x10 portion of the cross-strip anode, the system accurately localizes photons in both space and time and achieves a spatial precision of 4.1 µm (62 times smaller than the pitch spacing) and a temporal precision of 55 ps (at 500 MHz digitization).

Date: Monday, August 3, 2020
Time: 2:00 p.m.
Meeting: https://wustl.zoom.us/j/93194155429?
Meeting ID: 931 9415 5429
Password: Please contact Francesca Allhoff at: f.allhoff@wustl.edu

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