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Development of a high-frequency electronic integrator for photon-number resolving detectors KRISTINA MEIER, MICHAEL WAYNE, PAUL KWIAT, University of Illinois at Urbana-Champaign — Efficient photon-number-resolving single-photon detectors are a critical resource for optical quantum information processing, e.g., for realizing deterministic single-photon production. Previously, we have developed Visible Light Photon Counters (VLPCs) that can detect single photons with high quantum efficiency. The detector configuration allows photons to initiate multiple electron avalanches simultaneously, creating a signal with a charge proportional to the number of photons detected. One current obstacle is the extraction of the total charge of each pulse at frequencies ranging from 200 MHz to 20 GHz. The charge of each pulse is proportional to the area under the input signal and so we are currently developing an electronic integrator that, with appropriate signal amplification, will produce an output signal of pulses with heights equal to the integral of the VLPC pulse, thereby fully realizing the photon-number resolving capabilities of these detectors. Finally, we are also studying the use of optical annealing to reduce the detector's dark counts.

Kristina Dungan
University of Illinois at Urbana-Champaign

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