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Fast, Single-photon Detection with Superconducting Niobium Nanowires ANTHONY ANNUNZIATA, Yale University, AVIAD FRYDMAN, Bar Ilan University, MICHAEL ROOKS, IBM T. J. Watson Research Center, DANIEL PROBER, Yale University — We present recent measurements of the quantum efficiency, counting rate, and dark count rate for single-photon detectors based on superconducting niobium nanowires at 337 nm and 470 nm wavelengths for several detector geometries. From this data it is shown that the reset time (and therefore the single-photon counting rate) of these detectors is not dependent on the kinetic inductance of the niobium wire, as is the case for other detectors of this type made from niobium-nitride. The counting rate approaches 1 GHz even for very large area (100 μm^2) detectors. A phenomenological model of detection is presented that suggests the ability to resolve the number of photons absorbed during individual detection events. Preliminary data is shown that supports this assertion. These detectors have a variety of potential applications ranging from VLSI circuit diagnostics to quantum communication and single molecule spectroscopy. This work is supported by NSF and IBM research.

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