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An optical antenna for high-count-rate single-photon-sensitive superconducting transition edge sensors[1] FAUSTIN CARTER, DANIEL SANTAVICCA, DANIEL PROBER, Yale University — There are number of promising applications for a GHz count-rate, energy-resolving single-photon detector in the near-infrared. However, such a detector has not yet been perfected. For thermal detectors, this is partly due to the difficulty of coupling relatively large (∼1 micron) photons into the necessarily small (∼100 nm) thermal sensor element. We report on the simulation, fabrication, and preliminary measurements of an antenna-coupled superconducting transition edge sensor. The optical antenna is designed to directly couple incident near-infrared photons into much shorter wavelength surface plasmons, which are then delivered to a nanoscale superconducting niobium detector element at the antenna feed. This detector is inherently energy resolving, unlike the superconducting nanowire single-photon detector (SNSPD) or the single-photon avalanche photodiode (SPAD), and it operates at the relatively convenient temperature of 4 K.

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