Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Effective medium theory for the design of superconducting nanowire single-photon detectors[1] GREGORY LAFYATIS, DANIEL GAUTHIER, Department of Physics, Ohio State University — Superconducting nanowire detectors are an important resource in quantum information science because of their high detection efficiency, low dark count rates, and high saturated detection rates. To obtain high efficiency, an optical cavity is placed around the nanowire to increase the absorption. Recent designs show that high efficiencies can also be obtained by placing the nanowire on top of a "half cavity," consisting of a dielectric spacer and a metallic mirror or directly on top of a dielectric stack of alternating high and low refractive index layers. Optimizing the design of these structure often requires numerical simulations of the optical structure, which can be quite time consuming especially for TM-polarized light. Here, we use an effective medium model which is appropriate for thin nanowires typically used in these detectors. Such an approach can greatly facilitate optimizing the design of detector optical structures. We compare the results of the effective medium model to other effective approaches and numerical simulations of the full problem.

[1]ONR MURI program on Wavelength-Agile Quantum Key Distribution in a Marine Environment, Grant N00014-13-1-0627

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Date submitted: 15 Nov 2016 Electronic form version 1.4