Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Investigation of the Wave Propagation of Vector Modes of Light in a Spherically Symmetric Refractive Index Profile PRESTON POZDERAC, CODY LEARY, Coll of Wooster — We investigated the solutions to the Helmholtz equation in the case of a spherically symmetric refractive index using three different methods. The first method involves solving the Helmholtz equation for a step index profile and applying further constraints contained in Maxwell's equations. Utilizing these equations, we can simultaneously solve for the electric and magnetic fields as well as the allowed energies of photons propagating in this system. The second method applies a perturbative correction to these energies, which surfaces when deriving a Helmholtz type equation in a medium with an inhomogeneous refractive index. Applying first order perturbation theory, we examine how the correction term affects the energy of the photon. In the third method, we investigate the effects of the above perturbation upon solutions to the scalar Helmholtz equation, which are separable with respect to its polarization and spatial degrees of freedom. This work provides insights into the vector field structure of a photon guided by a glass microsphere.

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Date submitted: 11 Nov 2016 Electronic form version 1.4