Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

A model for the influence of granularity in a negative refractive index metamaterial lens[1] KEVIN WEBB, JIA-HAN LI, Purdue University — An important goal in building a negative refractive index metamaterial lens at optical frequencies is the achievement of sub-wavelength image resolution. In assigning an effective medium negative refractive index, the electric and magnetic dipoles (which give rise to negative permittivity and permeability) need to be dense relative to the wavelength, i.e., operation near the center of the first Brillouin zone is a prerequisite. Sub-wavelength imaging requires good performance for a significant portion of the evanescent plane wave spectrum. We use a model comprised of discrete regions with negative permittivity and permeability, calculate the effective medium parameters, and show the impact of granularity level (scatterer density) on the performance of a discrete lens, using the slab lens as a reference. We thus arrive at a measure of metamaterial density required to achieve significant improvement over traditional lensing approaches.

[1]Supported in part by DOE and NSF.

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Date submitted: 04 Dec 2005 Electronic form version 1.4