

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Negative refractive index in doped semiconductors ADIL-GERAI KUSSOW, University of Massachusetts Lowell, Department of Physics, ALKIM AKYURTLU, University of Massachusetts Lowell, Engineering and Computer Science Department — Based on methods of Quantum Optics, the possibility of achieving the negative index of refraction in a semiconductor with donor-like impurity is discussed. The quantum states of hydrogen-like donor atom and states of an electron in the conduction band constitute a discrete-level atomic medium within the optical range. The coherent coupling of an electric dipole transition with a magnetic dipole transition leads to permeability and permittivity responses and, within some frequency band, ensures the negative refractive index. The magnetic moment between two quasi-atomic states separated by optical frequencies is induced by the low-frequency e.m. field. The implementation of this scheme is carried out in tin-doped indium oxide (ITO) and calculations show feasibility of this effect within a broad bandwidth with a high figure of merit ~ 10 .

Adil-Gerai Kussow
University of Massachusetts Lowell, Department of Physics

Date submitted: 16 Nov 2009

Electronic form version 1.4