Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Negative refraction without absorption in the optical regime JUERGEN KAESTEL, MICHAEL FLEISCHHAUER, Technical University Kaiserslautern, SUSANNE F. YELIN, University of Connecticut, RON L. WALSWORTH, Harvard-Smithsonian Center for Astrophysics — We show that interference phenomena such as electromagnetically induced transparency together with local field effects can lead to negative refraction with strongly suppressed absorption in the optical regime. For this chirality induced by the coherent coupling of a magnetic dipole transition to a nearly degenerate electric dipole transition in a V-type configuration is employed. In this way negative refraction can be obtained without the need of negative permeabilities, thus substantially reducing the requirements on density and magnetic dipole strength. Furthermore while leading to a constructive interference of the cross-coupling and thus to an enhancement of chirality, the coherent coupling also causes a destructive interference in the imaginary part of the electric susceptibility and thus to a suppression of absorption. A remarkable amplification of these effects happens when local field corrections become important: While the refractivity of the medium saturates with increasing density, the absorption decreases in an exponential way, leading to very large refraction/absorption ratios.

Michael Fleischhauer
Technical University Kaiserslautern

Date submitted: 27 Jan 2006 Electronic form version 1.4