Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Criteria for a Brewster angle in negative-index materials[1] C.J. FU, Woodruff School of Mechanical Engineering, Georgia Tech., P.N. FIRST, School of Physics, Georgia Tech., Z.M. ZHANG, Woodruff School of Mechanical Engineering, Georgia Tech. — The demonstration of negative-index materials (NIMs) has resulted in a surge of interest in the study of reflection and refraction at the interfaces of NIMs. The Brewster angle can exist in both TE and TM waves for scattering upon an NIM. We present criteria for the existence of a Brewster angle for polarized plane waves incident between arbitrary lossless media. The results are summarized in a regime map, based on the permittivity and permeability of the two media. The well-known result for normal dielectrics (refracted wave perpendicular to reflected) is shown to be a special case which has a counterpart for incidence on an NIM: The refracted wave is perpendicular to the incident wave at the Brewster angle when ε_1 = -ε_2 or $\mu_1 = -\mu_2$. The Ewald-Oseen extinction theorem is applied as an aid to understanding the results. This work may be a useful supplement to the understanding of the material's electromagnetic behavior.

[1]*Supported by NSF (CTS-0236831) and DOE (DE-FG02-02ER45956).

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Date submitted: 29 Nov 2004 Electronic form version 1.4