

Abstract Submitted  
for the MAR05 Meeting of  
The American Physical Society

### **Anomalous**

#### **refractive effects at the interface of two-dimensional photonic crystals**

COSTAS M. SOUKOULIS, STAVROULA FOTEINOPOULOU<sup>1</sup>, Ames Laboratory US-DOE and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011. — Photonic crystals (PCs) can enable left-handed (backwards wave) propagation when certain conditions are met [1]. Nonetheless, negative refraction at PC interfaces is neither a prerequisite nor a manifestation of backwards wave propagation [2]. We study systematically the refractive behavior of two-dimensional PCs with the Finite Difference Time Domain (FDTD) method [3]. We have identified four distinct cases for which a negatively refracted beam is present. We analyze the different mechanisms that can lead to a negatively refracted beam with the wave vector diagram formalism. We found that such formalism is general, and always leads to a correct prediction/interpretation of the refracted beam(s). On the other hand, the Bragg rule, although widely used, can be applied only to specific cases that involve an interface of a two- or three- dimensional photonic crystal. [1] S. Foteinopoulou, E. N. Economou, and C. M. Soukoulis, Phys. Rev. Lett. 90, 107402 (2003). [2] S. Foteinopoulou and C. M. Soukoulis, Phys. Rev. B 67, 235107 (2003). [3] S. Foteinopoulou and C. M. Soukoulis, cond-mat/0403542.

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Date submitted: 05 Dec 2004

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