Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Measuring the curves of dispersion for dielectrics using a low-energy laser and a thermal source of radiation ROBERT LANNING, CRISTIAN BAHRIM, DON DUPLAN, Lamar University, WEI-TAI HSU, National Central University, Taiwan — We propose a simple and accurate method for finding curves of dispersion for solid and liquid dielectrics using polarized light reflected by their surface near the Brewster angle. A precision of 0.0001 for indices of refraction can be achieved from running a parabolic fit through the experimental data for the parallel component of the reflectance normalized to the total reflectance in a region only 15 degrees wide around the Brewster angle [1]. This precision allows accurate measurements of small changes in the indices of refraction that cannot be measured with other existing methods. For example, such changes can be produced by the temperature variation on the dielectric surface. In this paper we show that using a low-energy laser beam (such as the inexpensive red diode laser of 650 nm) and a thermal (blackbody) source of radiation one can easily generate precise curves of dispersion in the visible and ultraviolet spectrum for any dielectric transparent to this radiation. Our interpretation is based on the Lorentz model for the interaction between dipoles on the dielectric surface and the incident optical field. The average thermal energy of the blackbody source can be associated to an effective frequency. This thermal energy contributes to a higher frequency of oscillation of these dipoles and can be measured as a slight increase in the value of the refractive index. The project was partially supported by the McNair Scholars Program and STAIRSTEP-NSF-DUE grant# 0757057. [1] Bahrim C and Hsu W-T, 2009 *Am. J. Phys.* **77** (4) 337-343.

Robert Lanning
Lamar University

Date submitted: 15 Dec 2011 Electronic form version 1.4