Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Relativistic Depolarization Effects in Thomson Scattering E. PARKE, V.V. MIRNOV, D.J. DEN HARTOG, Y.M. YANG, University of Wisconsin-Madison — Relativistic depolarization effects have been well studied for several cases of Thomson scattering - particularly the simplifying case of 180 ° backscattering utilized in LIDAR Thomson scattering systems [K. V. Beausang and S. L. Prunty, Plasma Phys. Control. Fusion 50, 095001 (2008)], as well as the more general case where the detector is assumed to collect only scattered radiation with the component of the scattered electric field parallel to the incident wave electric field [O. Naito, H. Yoshida, and T. Matoba, Phys. Fluids B 5, 4256 (1993)]. These results are not valid for the Thomson scattering diagnostic on the MST reversed-field pinch, which collects all polarizations of the scattered radiation and measures radiation scattered at many different angles. We derive a compact form for the scattering spectrum for this case and present an analytic approximation. The accuracy of this approximation is determined for temperatures up to 40 keV. This derivation improves the accuracy of Thomson scattering measurements made on the MST without sacrificing calculation speed; even at temperatures of a few keV, the onset of relativistic depolarization can significantly alter the scattering spectrum. Furthermore, this approximation provides an accurate spectrum of interest in the study of higher-temperature fusion plasmas. *This work was supported by the U.S. Department of Energy.

Eli Parke
University of Wisconsin-Madison

Date submitted: 21 Jul 2009 Electronic form version 1.4