Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

**On the Unique Identification of the Polar Optical Kerr Effect with Microscopic Time-Reversal Symmetry Breaking** ALEXANDER FRIED, Stanford University — Over the past few decades, there has been an ongoing discussion regarding the choice of electromagnetic constitutive relations which correctly model linear media that exhibit natural optical activity, with most recent debate involving applications to optical phenomena in chiral superconductors and other gyrotropic media. In particular, is the controversy as to whether light incident upon naturally active materials will exhibit non-reciprocal polarization rotation in reflection, also known as the magneto-optical Kerr effect. A variety of constitutive relations have been postulated which describe the Electrodynamics within such materials, but only some of them predict this phenomena, while experimental investigations have similarly yielded mixed results. One such experiment uses a modified Sagnac Interferometer for high resolution and unique measurements of the Kerr effect and also has the property that it inherently tests for "reciprocity," a metrological symmetry wherein the results of a measurement are the same as when an optical source and an optical detector are interchanged. We demonstrate theoretically and experimentally that the Sagnac Interferometer only measures time-reversal symemtry breaking and that gyrotropic materials can not give rise to a Kerr Effect.

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Date submitted: 15 Nov 2013 Electronic form version 1.4