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Non-Perturbative Measurements of Low and Null Magnetic Field in High Temperature Plasmas Using the Hanle Effect RICHARD IGNACE, East Tennessee State University, DEEPAK GUPTA, TAE Technologies, Inc., KENNETH NORDSIECK, University of Wisconsin-Madison — Magnetic fields are typically used to confine high-temperature fusion plasmas. However, the plasma itself can generate magnetic fields that compete with those externally imposed to modify the confinement strategies. In a Field Reversed Configuration (FRC) or similar confinement configurations, in-situ non-perturbative measurement of magnetic fields is particularly difficult due to its low and near-zero magnitude. While the insertion of probes can measure the low field, they severely degrade the plasma, and the probe devices themselves can be damaged owing to high temperature. We explore the use of the Hanle effect as non-perturbative probe of magnetism in the confined plasma. The effect is regularly used in solar plasmas for the field measurements. The Hanle effect refers to how resonance scattering polarization is modified in the presence of "weak" fields (i.e., Zeeman broadening is comparable to natural broadening). We report on a pilot study using He-Ne lasers for proof of concept.

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