Poster Presentation P35

INVESTIGATING FARADAY ROTATION USING ALTERNATING CURRENT MAGNETIC FIELDS

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Motivated by recent investigations of Faraday rotation using alternating current magnetic fields,1,2,3 we have constructed a simple apparatus providing accurate Verdet constant measurements at the highest modulation frequencies to date. Specifically, we have measured the Verdet constants of water, ethyl alcohol and SF59 flint glass with magnetic field frequencies ranging from a few hundred Hz to approximately ten kHz. Agreement with accepted values is obtained up to three or four kHz, depending on the sample, when compared to the tabulated values for these materials using conventional DC Faraday Effect measurements. However, we have found an unexpected enhancement of the Faraday rotation at the higher frequencies and we are presently attempting to understand these anomalous results. Presently, we are assuming that this increased response results from an experimental artifact and we in search of any potential procedural inadequacies that could account for this behavior before we can report the results as evidence of "new physics". So, we will continue to fine-tune our technique with the aim of either further extending the frequency limits, and hence the fidelity of the high frequency response of the apparatus before justifying an indisputable, and as of yet, unpredicted modulation frequency dependent response.

1 K. Turvey, "Determination of Verdet constant from combined ac and dc measurements," Rev. Sci. Instrum. 64 (6), 1561-1568 (1993).
2 O. Brevet-Philibert and J. Monin "The measurement of the Faraday effect in alternating magnetic fields: a new and simple method," Meas. Sci. Technol. 1 362-364 (1990).
3 A. Jain, et al. "A simple experiment for determining Verdet constants using alternating current magnetic fields," Am. J. Phys. 67 (8), 714-717 (1999).