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An Interferometric Approach to Time Resolved Faraday Rotation Measurements J.M. LAFORGE, University of Victoria, G.M. STEEVES, University of Victoria — Time Resolved Faraday Rotation (TRFR) is an optical pump-probe technique used to detect electron spin precession about an external magnetic field in semiconductors. In TRFR a net electron magnetic moment can induce small rotations in the polarization of the probe beam, which are detected through a polarizing cube beam splitter and two balanced photodiodes. We present a new approach that divides the probe beam into two orthogonally polarized arms of a free-space Mach-Zender interferometer where one arm contains the sample being studied. Recombination of the probe beams optically amplifies the Faraday Rotation (FR) signal. There are two benefits to this approach; traditional samples can be probed at lower intensities while maintaining signal quality, and weak FR signals, such as those found in the spintronic studies of quantum dot materials, can be optically amplified before detection. Vibrational isolation and thermal stability are important operational factors since the optical gain can be affected by optical path length difference between the two arms of the interferometer.

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