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Optical Measurement of Shock Demagnetization in Single Crystal Yttrium Iron Garnet BRIAN WILMER, SURVICE Engineering Company, STEVEN DEAN, JENNIFER GOTTFRIED, WILLARD UHLIG, JAMES CAZAMIAS, U.S. Army Research Laboratory — The shock-induced demagnetization of a yttrium iron garnet (YIG) disk (350 m x 5 mm) is examined by measuring the change in Faraday rotation. Faraday rotation is an effect in which polarization rotation is induced in light by applying a magnetic field to a medium. Statically varying the applied magnetic field showed a maximum rotation of about 21 degrees at magnetic saturation. An air shock was generated by focusing a Nd:YAG laser pulse (up to 850 mJ, 6 ns) to cause breakdown in air, which then impinged upon the edge of the disk. The change in the magnetic state of the YIG was observed via rotation of the polarization back toward its initial state. Rise times were on the order of 1 s. In the wake of the shock, the sample relaxed back to its initial magnetized state over several microseconds. As the applied magnetic field and shock intensity decreased, the relaxation time increased and the demagnetization magnitude decreased.

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