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Measurements of the Domain Magnetization Direction and its Effects on the Sensitivity of Magneto-optic Field Sensors. MANNIX SHINN, ANTHONY GARZARELLA, DONG HO WU, United States Naval Research Laboratory, RONGJIA TAO, Temple University — Bismuth doped, rare earth iron garnet (Bi:RIG) thick films exhibit a large magneto-optic response to external magnetic fields while exhibiting low optical insertion loss, making them ideal candidates for polarimetric magnetic field sensors. It was generally found that the Faraday rotation and overall sensitivity of the sensors depends on the orientation of the local domain magnetization relative to the direction of laser propagation. In arrayed Bi:RIG sensors, it is critical that the optical path of the laser is perpendicular to the easy-axis of each film of the array, in order to avoid magnetically-induced optical incoherence (MIOI). Therefore a precise, localized measurement of the magnetization vector within the films is necessary. Since traditional magnetization measurement techniques do not provide adequate resolution, several new approaches to precisely measure the easy axis were developed and will be described in this presentation. These approaches involve measurements of the directionality of the Faraday response, incoherence in the Malus curves, and damping in the domain wall motion. Such measurements have been instrumental in constructing and optimizing arrayed Bi:RIG sensors, which currently have a sensitivity of $6 \text{ pT/Hz}^{1/2}$.

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