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Ultra high sensitivity, room temperature magneto-optic field sensor made of ferromagnetic bismuth rare-earth iron garnet thick films DONG HO WU, ANTHONY GARZARELLA, Naval Research Laboratory, VINCE FRATELLO, Integrated Photonics, Inc — The ferrimagnetic bismuth rare-earth iron garnet $(BiGdLu)_3(FeGa)_5O_{12}$ thick film has a specific Faraday rotation θ_S of 0.09 $^\circ$/mm at 1550 nm and excellent transparency at infrared wavelengths. Using the thick film we recently have demonstrated a magneto-optic (MO) field sensor with a sensitivity of about 10^{-14}T/Hz$^{1/2}$, comparable with SQUID. The sensor is made of all dielectric materials including the bismuth rare-earth iron garnet and optical fibers, and is operated at room temperature without any cooling requirement. The MO field sensor is capable to measure a magnetic field over a very large dynamic range (from a very weak field to a very high magnetic field exceeding several hundred Tesla) and over a very wide frequency range, which may be from DC to a few hundred GHz. However, presently, our MO sensor's frequency range is limited from DC to 2 GHz. We think that this limited frequency range is due to the presence of magnetic domains in the bismuth rare-earth iron garnet film. In this presentation we will report our experimental results obtained from this MO field sensor as well as the effect of magnetic domains.

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