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Sagnac type fiber interferometer for magneto-optic Kerr effect measurement at cryogenic temperatures[1] JING XIA, Stanford University, PETER BEYERSDORF, San Jose State University, MARTIN FEJER, AHARON KAPITULNIK, Stanford University — We describe a Sagnac type magneto-optical interferometer operating at 1550 nm wavelength in which the fast and slow axis of a single 10-meter long Polarization-Maintaining fiber were used as the Sagnac loop. The last 2 meters of this PM fiber were fed into a cryogenic probe to measure Kerr rotation. This zero-area-Sagnac-loop design is virtually immune to temperature fluctuations and mechanical bending of the fiber, and can work at much lower temperature ($<$ 1 K) compared to apparatus with optical windows. Most important, no perturbing AC magnetic field is needed. Up to now, we have achieved a Kerr rotation sensitivity of $2.5 \times 10^{-7} rad/\sqrt{Hz}$ down to liquid Helium temperature, with$4\mu W$of optical power at the detector. Drifts of this apparatus were observed to be less than$0.5 \times 10^{-7} rad/Hour$. We studied ferromagnetic transition and magnetic domains of thin (3 to 30 nm) $SrRuO_3$ films by cooling them through Tc in zero fields ($<$ 5 mG) and measuring polar Kerr rotations.

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