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MOKE measurements of spin polarization in topological insulators[1] BEREND JONKER, OLAF VAN 'T ERVE, Naval Research Laboratory, S. RAJPUT, LIAN LI, University of Wisconsin, Milwaukee, CONNIE LI, Naval Research Laboratory — The Dirac surface states of a topological insulator (TI) exhibit spin-momentum locking, where an unpolarized charge current creates a net spin polarization whose amplitude and orientation are controlled by the charge current [1-3]. This polarization has been detected electrically using a magnetic contact. Here we use the magneto optic Kerr effect (MOKE) to detect this spin polarization optically. We deposit a 10nm layer of Al on a Bi_2Se_3 TI film and measure the Kerr rotation produced by an unpolarized bias current. Aluminum was chosen because it is a good spin diffusion layer and is optically opaque, making the MOKE measurement more sensitive to the spins generated near the top surface of the TI film. Modulating the charge current through the TI produces a corresponding response in the MOKE signal. We also show that spin diffusion from the TI into an Fe surface contact can rotate the Fe magnetization by spin transfer torque [4]. We apply a constant bias field of 32 Oe and modulate the in-plane bias current while measuring the Kerr rotation of the Fe contact. A clear correlation between charge current and Kerr rotation is observed that cannot be explained by simple Oersted fields arising from the charge current, indicating that the spin transfer torque from Bi_2Se_3 into Fe is responsible. [1] C.H. Li et al, *Nature Nanotech.* 9, 218 (2014) [2] J.S. Lee et al, *Phys. Rev. B* 92, 155312 (2015) [3] C.H. Li et al, arXiv:1605.07155v1; *Nature Commun.* (Nov. 2016) [4] A. R. Mellnik, et al. *Nature* 511, 449 (2014)

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