Abstract Submitted
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Electrical detection of spin-momentum locking in topological insulators[1] CONNIE LI, OLAF VAN 'T ERVE, JEREMY ROBINSON, Naval Research Lab, YAOYI LI, LIAN LI, University of Wisconsin, Milwaukee, BERRY JONKER, Naval Research Lab — One of the most striking properties of topological insulators (TIs) is that of spin-momentum locking – the spin of the TI surface state lies in-plane, and is locked at right angle to the carrier momentum. While anticipated by theory, direct electrical access to this spin system in a simple transport structure had been challenging, due to that the bulk is typically unintentionally doped and contributes to transport. Using a ferromagnet/tunnel barrier detector contact that preferentially probes surface/interface spins, we have demonstrated the first direct electrical detection of spin-momentum locking in the TI surface states in MBE-grown Bi_2Se_3 [1]. However, as the bulk carrier concentration for Bi_2Se_3 is typically in the $10^{19}/cm^3$ range, the Fermi level is well within the conduction band, where a significant portion of the current is shunted through the bulk. Moving the Fermi level to within the gap is desirable to eliminate current shunting, as well as contribution from Rashba 2DEG states that may dilute the signal [2]. These results, as well as how they affect the spin signal measured will be discussed at the meeting. [1] C. H. Li, et. al., Nat. Nanotech. 9, 218 (2014). [2] S. Hong et. al., PRB 86, 085131 (2012).

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