Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Tunable Intrinsic Spin Hall Conductivities in $Bi_2(Se,Te)_3$ Topological Insulators[1] CÜNEYT ŞAHIN, MICHAEL E. FLATTÉ, Optical Science and Technology Center and Department of Physics and Astronomy, University of Iowa, Iowa City, Iowa 52242, USA — It has been recently shown by spin-transfer torque measurements that Bi_2Se_3 exhibits a very large spin Hall conductivity (SHC)[1]. It is expected that Bi_2Te_3, a topological insulator with similar crystal and band structures as well as large spin-orbit coupling, would also exhibit a giant SHC. In this study we have calculated intrinsic spin Hall conductivities of Bi_2Se_3 and Bi_2Te_3 topological insulators from a tight-binding Hamiltonian including two nearest-neighbor interactions. We have calculated the Berry curvature, used the Kubo formula in the static, clean limit and shown that both materials exhibit giant spin Hall conductivities, consistent with the results of Ref. 1 and larger than previously reported $Bi_{1-x}Sb_x$ alloys[2]. The density of Berry curvature has also been computed from the full Brillouin zone in order to compute the dependence of the SHC in these materials on the Fermi energy. Finally we report the intrinsic SHC for $Bi_2(Se,Te)_3$ topological insulators, which changes dramatically with doping or gate voltage. [1] A.R. Mellnik et al., Nature 511, 449 - 451 (2014) [2] C.Şahin and M.E.Flatté, arXiv:1410.7319

[1]This work was supported in part by C-SPIN, one of six centers of STARnet, a Semiconductor Research Corporation program, sponsored by MARCO and DARPA.

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Date submitted: 14 Nov 2014 Electronic form version 1.4