

Abstract Submitted
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A thermodynamic measure of the Magneto-electric coupling in the 3D topological insulator¹ DORON BERGMAN, GIL REFAEL, California Institute of Technology — We show that the magneto-electric coupling in 3D (strong) topological insulators is related to a second derivative of the bulk magnetization. The formula we derive is the non-linear response analog of the Streda formula for Hall conductivity (P. Streda, J. Phys. C: Solid State Physics, 15, 22 (1982)), which relates the Hall conductivity to the derivative of the magnetization with respect to chemical potential. Our finding allows one to extract the magneto-electric coefficient by measuring the magnetization, while varying the chemical potential and one more perturbing field. Such an experimental setup could circumvent many of the current difficulties with measuring the magneto-electric response in 3D topological insulators. The relation we find also makes transparent the effect of disorder, contained entirely in the density of states, and changing nothing as long as the system is gapped.

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