Abstract Submitted
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Witten effect in a topological insulator GILAD ROSENBERG, MARCEL FRANZ, University of British Columbia — It has been established recently that topological insulators exhibit non-trivial electromagnetic response described by the 'axion' term $\Delta\mathcal{L}_{\rm axion} = \theta(e2/2\pi h)\mathbf{E}\cdot\mathbf{B}$ with $\theta = \pi$. The parameter θ is known to particle physicists as the axion field and whether or not it has a nonzero vacuum expectation value remains a fundamental open question of the Standard Model. A key manifestation of axion electrodynamics is the Witten effect, according to which a unit magnetic monopole placed inside an axion medium is predicted to bind fractional charge $-e(\theta/2\pi)$. I will present a proposal for a first test of the Witten effect. Using a simple model for a topological insulator we demonstrate the existence of a fractional charge bound to a monopole by an explicit numerical calculation. We also propose a scheme for generating an 'artificial' magnetic monopole in a topological insulator film that may be used to facilitate an experimental test of Witten's prediction in a solid state system.

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