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Magnetoelectric response of a topological surface under the conditions of an imperfect quantum Hall effect[1] ALLAN MACDONALD, DMYTRO PESIN, The University of Texas at Austin, Austin, TX — An effective magnetic monopole is induced by an external charge in a topological insulator, and in an ordinary insulator covered by a graphene sheet or another two-dimensional electron system, when it has a perfect surface quantum Hall effect [X.-L. Qi, R. Li, J. Zang, and S.-C. Zhang, Science **323**, 1184 (2009)]. We discuss the observability of this magnetoelectric response under the realistic conditions of a quantum Hall effect that is imperfect because of finite temperature, disorder, or unintended doping. By generalizing the surface electrodynamics to allow for a finite longitudinal conductivity, we analyze the transient behavior which occurs as the potential from a suddenly introduced external charge is screened. Screening severely limits the experimental time scales on which observation of magnetic-monopole-related phenomena is possible. We estimate the longitudinal conductivity values that are necessary for the monopole to survive for an extended period of time and discuss implications of our findings for other transport properties of the surface.

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