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Orbital magnetoelectric coupling in band insulators ANDREW ESSIN, ARI TURNER, JOEL MOORE, University of California, Berkeley, DAVID VANDERBILT, Rutgers University — Magnetoelectric responses are a fundamental characteristic of materials that break time-reversal and inversion symmetries, notably multiferroics, and, remarkably, of topologically nontrivial materials in which those symmetries are unbroken. Previous work has shown how to compute almost all contributions to the magnetoelectric tensor. Here we complete the linear response problem for band insulators by computing the electronic polarization resulting from an applied magnetic field. One part of this response can appear even in time-reversal-symmetric materials and was previously shown to be quantized in “topological insulators.” In so doing we present both a useful formalism for dealing with uniform magnetic fields and a treatment based on a long wave approximation of the field. Finally, we discuss properties of band structures that can cause the response to vanish.

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