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Systematic study of magnetotransport responses within the Berry-Boltzmann formalism

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There has been recently a huge renewed interest in the literature to the study of currents generated in solids by external electrical and magnetic fields. Different authors considered different models and different conditions and assigned different (sometimes confusing) names to various contributions to the current. The goal of this article is to bring order into the field, by systematizing the responses according to their properties with respect to the inversion and time-reversal symmetry. We perform a careful derivation of the formula for the current generated by electric and magnetic fields and classify the terms by their microscopic origin (classical, Berry curvature, Zeeman, and Berry-Zeeman).