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Anomalous Hall effect in current-carrying states of matter: topology, commensuration effects, and application to Kerr measurements in the underdoped cuprates[1] CATHERINE KALLIN, EDWARD TAYLOR, McMaster University — We calculate the anomalous Hall conductivity for states characterized by patterns of spontaneous currents. Using an exact Ward identity, we find that the DC Hall conductivity is topological provided the current pattern is commensurate and the Fermi surface is fully gapped. For incommensurate patterns, the DC Hall conductivity can be infinite, analogous to the infinite conductivity of a sliding charge density wave. We also discuss the optical Hall conductivity at high frequencies, in connection with Kerr rotation experiments performed on the underdoped cuprates.

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