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Second Order Effective Theory of Bloch Electrons in Electromagnetic Fields YANG GAO, SHENGYUAN YANG, QIAN NIU, UT Austin — In the first order effective theory of Bloch electrons in electromagnetic fields, the Berry curvature is introduced to yield an anomalous velocity term, which results in profound modification of the phase space density of states. Here we derive the second order single band effective theory, finding that the semiclassical dynamics of physical variables still follows the same structure as before, but with additional field corrections in the Berry curvature and band energy. We also discuss applications of our theory and its extension to multiple band case.

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