

Abstract Submitted
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Berry Phase Modification to the Energy Spectrum of Excitons¹

DI XIAO, JIANHUI ZHOU, WENYU SHAN, Carnegie Mellon Univ, WANG YAO, University of Hong Kong — By quantizing the semiclassical motion of excitons, we show that the Berry curvature can cause an energy splitting between exciton states with opposite angular momentum. This splitting is determined by the Berry curvature flux through the k -space area spanned by the relative motion of the electron-hole pair in the exciton wave function. Using the gapped two-dimensional Dirac equation as a model, we show that this splitting can be understood as an effective spin-orbit coupling effect. In addition, there is also an energy shift caused by other relativistic terms. Our result reveals the limitation of the venerable hydrogenic model of excitons, and it highlights the importance of the Berry curvature in the effective mass approximation.

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