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Visualizing Landau levels of Dirac electrons in Bi_2Te_3 in a one dimensional potential DANIEL WALKUP, YOSHINORI OKADA, WENWEN ZHOU, CHETAN DHITAL, YING RAN, ZIQIANG WANG, STEPHEN WILSON, VIDYA MADHAVAN, Boston College — When a magnetic field is applied to a solid, the electrons fall into discrete, highly degenerate Landau levels. In each Landau level the wavefunction has a certain characteristic spread, which increases with the energy (index) of the level. This has important physical consequences especially in the presence of spatial inhomogeneity. Using scanning tunneling spectroscopy, we have examined the Dirac electrons on Bi_2Te_3 under a magnetic field and subject to a smooth one-dimensional periodic potential. We find that the lowest Landau levels track the potential variation, but the higher levels are more homogeneous. Through a calculation of the Landau level wavefunctions, we form a coherent picture of how their spread interacts with the potential landscape, explaining the experimental data. Our findings have important implications for transport and magneto-resistance measurements in Dirac materials with engineered potential landscapes.

Daniel Walkup
Boston College

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