

Two-dimensional Spin-orbit Coupled Degenerate Fermi Gas

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We report the experimental realization of two-dimensional (2D) SOC in degenerate ^{40}K Fermi gases using three lasers, each of which dresses one atomic hyperfine spin state. Through spin injection radio-frequency (rf) spectroscopy, we probe the spin-resolved energy dispersions of dressed atoms, and observe a highly controllable Dirac point created by the 2D SOC. The realized 2D SOC can be equivalent to the Rashba or Dresselhaus SOC if a simple transformation is applied. Our work paves the way for exploring high-dimensional topological matters in ultracold atoms using Raman schemes.

References:

[1] L. Huang, Z. Meng, P. Wang, P. Peng, S. Zhang, L. Chen, D. Li, Q. Zhou, J. Zhang, Experimental realization of a two-dimensional synthetic spin-orbit coupling in ultracold Fermi gases, arXiv:1506.02861.