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Chirality-dependent Hall Effect in Weyl Semimetals[1] SHENGYUAN YANG, Singapore University of Technology and Design, HUI PAN, Beihang University, FAN ZHANG, University of Texas at Dallas — We generalize a semiclassical theory and use the argument of angular momentum conservation to examine the ballistic transport in lightly-doped Weyl semimetals, taking into account various phase-space Berry curvatures. We predict universal transverse shifts of the wave-packet center in transmission and reflection, perpendicular to the direction in which the Fermi energy or velocities change adiabatically. The anomalous shifts are opposite for electrons with different chirality, and can be made imbalanced by breaking inversion symmetry. We discuss how to utilize local gates, strain effects, and circularly polarized lights to generate and probe such a chirality-dependent Hall effect.

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Shengyuan Yang
Singapore University of Technology and Design

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