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Magnetotransport study of Weyl orbit in Dirac semimetal CHENG ZHANG, SHIHENG LU, XIANG YUAN, FAXIAN XIU, State Key Laboratory of Surface Physics and Department of Physics, Fudan University, Shanghai 200433, China — Formed by the periodic motion of electrons through closed orbits in the momentum space, cyclotron orbits have been known for decades and widely used as an effective way to probe the Fermi surface by detecting the resultant quantum oscillations. Recent studies in topological systems show that a new type of electron orbits with open loop, known as Fermi arcs, will emerge at the surface of Weyl semimetals as a result of broken translational symmetry. Nevertheless, a complete cyclotron orbit can still be developed within open Fermi arcs on both sides of the surface, if electrons can tunnel through the bulk and remain phase coherent. Here, we present a systematic study of such Weyl orbit in Cd3As2 nanoplates with different Fermi levels through the Shubnikov–de Haas oscillations. We found that Weyl orbit persists as Fermi level approaches the Dirac nodes. In the meantime, a new set of Landau levels emerge at high field, indicating a crossover from inter- to intra- surface cyclotron due to the reduced symmetry under magnetic field. Our study clarifies recent debate whether the double Fermi arcs can form a stable Weyl orbit and highlights the importance of crystal symmetry as protection mechanism for double Fermi arcs. The strong interplay between crystal symmetry and surface Fermi arcs further enriches the underlying physics in topological semimetals.

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