

Abstract Submitted  
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**Are the surface Fermi arcs in Dirac semimetals topologically protected?**<sup>1</sup> YUAN MING LU, Department of Physics, The Ohio State University, Columbus, OH 43210, MEHDI KARGARIAN, Department of Physics, University of Maryland, College Park, MD 20742, MOHIT RANDERIA, Department of Physics, The Ohio State University, Columbus, OH 43210 — Motivated by recent experiments probing double Fermi arcs on the surface of Dirac semimetals (DSMs) Na<sub>3</sub>Bi and Cd<sub>3</sub>As<sub>2</sub>, we raise the question posed in the title. We find that, in marked contrast to Weyl semimetals, the Fermi arcs of DSMs are not topologically protected in general, except at certain time-reversal invariant momenta. For a simple 4-band model with a pair of Dirac nodes at  $\mathbf{k} = (0, 0, Q)$  gapless surface states are protected only at  $k_z = 0$ . We identify symmetry allowed bulk perturbations that destroy Fermi arcs, but show that they are necessarily small, i.e., higher order than terms kept in usual  $\mathbf{k} \cdot \mathbf{p}$  theory. We validate our conclusions about the absence of a topological invariant protecting the surface states in DSMs using a K-theory analysis for the space groups of Na<sub>3</sub>Bi and Cd<sub>3</sub>As<sub>2</sub>

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