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Boundary Conditions and Self-Adjoint Extensions of a Continuum Weyl Semimetal Hamiltonian[1] MICHAEL VENNETTILLI, Ursinus College, BABAK SERADJEH, Indiana University - Bloomington, ARIJIT KUNDU, Technion - Israel Institute of Technology & Indiana University - Bloomington, MOSTAFA TANHAYI AHARI, Indiana University - Bloomington — A Weyl semimetal is a Dirac material where the spin degeneracy of the energy-momentum Dirac cones is broken. The surface states of Weyl semimetals are expected to permit Fermi arcs connecting the surface-projections of the two Weyl nodes. The existence and physical properties of these surface states depends crucially on the boundary conditions at the surface. Generally speaking, boundary conditions placed on an unbounded Hermitian operator have an intimate relationship with the possible self-adjoint extensions of the operator. Indeed, determining the self-adjoint extensions of the operator naturally classifies all physical boundary conditions on the wavefunctions. We have studied the self-adjoint extensions of a model continuum Hamiltonian for Weyl semimetals and their corresponding classes of surface states. In this way, all possible physical surface spectra of the Weyl semimetal corresponding to different physical realizations of the surface are contained within our result.

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