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Tuning Weyl nodes with a magnetic field JENNIFER CANO, BARRY BRADLYN, Princeton Center for Theoretical Science, ZHIJUN WANG, MAX HIRSCHBERGER, N. PHUAN ONG, B. ANDREI BERNEVIG, Princeton University — For Weyl fermions to exist, either inversion or time reversal symmetry must be broken. Here, we consider materials with a normal and/or inverted band structure that display a four band (Dirac) crossing in the presence of both these symmetries. We show that when a magnetic field is applied, thus breaking time reversal, the four band crossing splits into several Weyl nodes, depending on the direction in which the magnetic field is applied as well as on the symmetry group that protected the Dirac crossing. For a particular material realization, relevant to current experiments performed in Princeton, we use a symmetry analysis to predict the position of the Weyl nodes when the magnetic field is along a high-symmetry axis. While the symmetry is not necessary to protect the Weyl crossings, it is a useful tool to find them. Our results agree with both an ab initio and a $k \cdot p$ effective Hamiltonian analysis.

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