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Helical Spin Order from Topological Dirac and Weyl Semimetals

XIAO-QI SUN, SHOUCHENG ZHANG, Stanford University, ZHONG WANG, Tsinghua University — We study dynamical mass generation and the resultant helical spin orders in topological Dirac and Weyl semimetals, including the edge states of quantum spin Hall insulators, the surface states of weak topological insulators, and the bulk materials of Weyl semimetals. In particular, the helical spin textures of Weyl semimetals manifest the spin-momentum locking of Weyl fermions in a visible manner. The spin-wave fluctuations of the helical order carry electric charge density; therefore, the spin textures can be electrically controlled in a simple and predictable manner.

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