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Persistent Spin Helix BOGDAN BERNEVIG, Princeton University, JOE ORENSTEIN, UC Berkeley, SHOU-CHENG ZHANG, Stanford university — Spin-orbit coupled systems generally break the spin rotation symmetry. However, for a model with equal Rashba and Dresselhauss coupling constant (the ReD model), and for the $[110]$ Dresselhauss model, a new type of SU(2) spin rotation symmetry is discovered. This symmetry is robust against spin-independent disorder and interactions, and is generated by operators whose wavevector depends on the coupling strength. It renders the spin lifetime infinite at this wavevector, giving rise to a Persistent Spin Helix (PSH). We obtain the spin fluctuation dynamics at, and away, from the symmetry point, and suggest experiments to observe the PSH.

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