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Observation of symmetry-protected topological phases with ultracold fermions[1] ZEJIAN REN, BO SONG, Hong Kong Univ of Sci Tech, LONG ZHANG, Peking University, CHENGDONG HE, Hong Kong Univ of Sci Tech, TING FUNG JEFFREY POON, Peking University, ELNUR HAJIYEV, SHANCHAO ZHANG, Hong Kong Univ of Sci Tech, XIONG-JUN LIU, Peking University, GYU-BOONG JO, Hong Kong Univ of Sci Tech — Synthetic spin-orbit coupling in cold atoms paves an intriguing new way to explore nontrivial topological orders beyond natural conditions. Here we report the observation of a novel kind of symmetry-protected topological (SPT) phase with spin-orbit coupled fermions in a Raman-dressed one-dimensional optical lattice [1]. This new SPT phase protected by a magnetic group symmetry and a nonlocal chiral symmetry is beyond traditional Altland-Zirnbauer tenfold classification. We determine topological invariant based on symmetric momenta in Bloch states. Furthermore, we investigate quench dynamics between topologically distinct phases by suddenly changing the band topology, which exhibits distinct behavior when the system is quenched to topological phase and trivial phase. Our work opens a new avenue for studying equilibrium and non-equilibrium topological physics with ultracold atoms.
[1] B.Song *et al.*, **Science Advances** *in press* (2018), *preprint :arXiv1706.00768.*

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