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Manipulating Topological Edge Spins in One-Dimensional Optical Lattice[1] XIONG-JUN LIU, University of Maryland, College Park, ZHENG-XIN LIU, Institute for Advanced Study, Tsinghua University, MENG CHENG, University of Maryland, College Park — We propose to observe and manipulate topological edge spins in 1D optical lattice based on currently available experimental platforms. Coupling the atomic spin states to a laser-induced periodic Zeeman field, the lattice system can be driven into a symmetry protected topological (SPT) phase, which belongs to the chiral unitary (AIII) class protected by particle number conservation and chiral symmetries. In free-fermion case the SPT phase is classified by a Z invariant which reduces to Z_4 with interactions. The zero edge modes of the SPT phase are spin-polarized, with left and right edge spins polarized to opposite directions and forming a topological spin-qubit (TSQ). We demonstrate a novel scheme to manipulate the zero modes and realize single spin control in optical lattice. The manipulation of TSQs has potential applications to quantum computation.

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