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Symmetry-protected topological phases of alkaline-earth cold fermionic atoms in one dimension SYLVAIN CAPPONI, Toulouse University, HELOISE NONNE, Technion, Haifa, MARION MOLINER, PHILIPPE LECHEMINANT, Université de Cergy-Pontoise, KEISUKE TOTSUKA, Kyoto University
— We investigate the existence of symmetry-protected topological phases in one-dimensional alkaline-earth cold fermionic atoms with general half-integer nuclear spin I at half filling. Using complementary techniques, we show that SU(2) topological phases are stabilized where the SU(2) symmetry stems from the existence of a metastable excited state in alkaline-earth atoms. On top of these phases, we find the emergence of topological phases with enlarged SU(2I+1) symmetry which depend only on the nuclear spins degrees of freedom. The main physical properties of the latter phases are further studied using a matrix-product state approach. We find that these phases are symmetry-protected topological phases, with respect to inversion symmetry, when I=1/2,5/2,9/2..., which is directly relevant to ytterbium and strontium cold fermions.

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