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Symmetry protected topological states in antiferromagnets with magnetic field SHINTARO TAKAYOSHI, National Institute for Materials Science, KEISUKE TOTSUKA, Yukawa Institute for Theoretical Physics, Kyoto University, AKIHIRO TANAKA, National Institute for Materials Science — A symmetry protected topological (SPT) phase is a short-range entangled state that cannot be adiabatically deformed into a direct product state under some symmetry. We show that magnetization plateau states of one-dimensional antiferromagnets in external magnetic field is in an SPT phase when $S - m$ is odd, where S and m represent a spin quantum number and magnetization per site, respectively, if the system respects a bond-center inversion symmetry. We map the antiferromagnets into a field theory of a nonlinear sigma model with a Berry phase term which has a coefficient proportional to the quantity $S - m$. This term appears in the functional form of the ground state wave function and dictates whether or not the system is in the SPT phase. We verify this prediction through numerical calculations of the entanglement spectra and an analysis using a matrix product state representation.

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