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Symmetry protected valence bond solid states and strange correlator SHINTARO TAKAYOSHI, University of Geneva, PIERRE PUJOL, University of Toulouse, AKIHIRO TANAKA, National Institute for Materials Science — We describe symmetry-protected topological (SPT) properties of quantum antiferromagnets using an effective field theory of nonlinear sigma models with topological Berry phase terms. We mainly focus on valence-bond-solid states on a two-dimensional square lattice, which has a spatially uniform ground state when the spin quantum number S is an even integer. By representing the ground state wave functional through a path integral, SPT properties appear in temporal surface term of a field theory defined in a space whose dimensionality is reduced by one. This representation allows us to conclude that the ground state can be an SPT state for $S = 2 \times$ odd integer while topologically trivial for $S = 2 \times$ even integer. We also show that this temporal surface term in the ground state wave functional is equivalent to strange correlator, which is proposed as an indicator of SPT phases.

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