Abstract Submitted
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Three dimensional symmetry protected topological phase and algebraic spin liquid CENKE XU, Department of Physics, University of California, Santa Barbara — It is well-known that one dimensional spin chains are described by O(3) nonlinear sigma models with a topological $\Theta-$term, and $\Theta = 2\pi S$. A pin-1/2 chain (described by $\Theta = \pi$) must be either gapless or degenerate, while a spin-1 chain (described by $\Theta = 2\pi$) is a symmetry protected topological phase, namely its bulk is gapped and nondegenerate, while its boundary is a free spin-1/2 with two fold degeneracy. We prove that these phenomena also occur in arbitrary odd dimensions. For example, in three dimensional space, we construct a series of SU(N) antiferromagnet models, whose low energy field theories are nonlinear sigma models with a 3+1d $\Theta-$term. We will also prove that when $\Theta = \pi$, the disordered phase of this system cannot be gapped and nondegenerate, namely it can be an algebraic liquid phase. When $\Theta = 2\pi$, the system is a three dimensional symmetry protected topological phase, whose 2+1d boundary must be either gapless or degenerate.

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