

Fermionic representation and mean field theory for large spin models

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We generalized the fermionic representation for $S = 1/2$ to large spin models. We find that integer spin and half-integer spin have different symmetry groups. This fermionic representation is helpful to study large-spin quantum magnetism. For instance, the Heisenberg model can be decoupled with fermion hopping and pairing terms such that one can apply mean theory to study its low energy physics. We studied a frustrated $S = 1$ antiferromagnet on triangular lattice and found a spin liquid phase. We also generalized the Gutzwiller projection to $S = 1$ mean field states, and the result is fairly good in 1-dimension.

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