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Resonating Valence Bond states for low dimensional S=1 antiferromagnets ZHENG-XIN LIU, Institute for Advanced Study, Tsinghua University, Beijing, China, YI ZHOU, ZheJiang University, HangZhou, China, TAI-KAI NG, Hong Kong University of Science and Technology,Clear Water Bay Road, Kowloon, Hong Kong — We study $S = 1$ spin liquid states in low dimensions. We show that the resonating-valence-bond (RVB) picture of $S = 1/2$ spin liquid state can be generalized to $S = 1$ case. For $S = 1$ system, a many-body singlet (with even site number) can be decomposed into superposition of products of two-body singlets. In other words, the product states of two-body singlets, called the singlet pair states (SPSs), are over complete to span the Hilbert space of many-body singlets. Furthermore, we generalized fermionic representation and the corresponding mean field theory and Gutzwiller projected stats to $S = 1$ models. We applied our theory to study 1D anti-ferromagnetic bilinear-biquadratic model and show that both the ground states (including the phase transition point) and the excited states can be understood excellently well within the framework. Our method can be applied to 2D $S = 1$ antiferromagnets.

Zheng-Xin Liu
Institute for Advanced Study, Tsinghua University, Beijing, China

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