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Theory of the Valence-Bond-Solid Phase on the Kagome Lattice of Zn-paratacamite
MICHAEL LAWLER, University of Toronto, LARS FRITZ, Harvard University, YONG BAEK KIM, University of Toronto, SUBIR SACHDEV, Harvard University — We present a theory of the valence-bond-solid phase discovered in a recent neutron scattering experiment [1] on Zn-paratacamite, Zn$_x$Cu$_{4-x}$(OH)$_6$Cl$_2$, at small $x$. A theory of the Neel phase also discovered in this experiment will be presented in a related contributed talk. Zn-paratacamite has been considered as an excellent model system for the kagome lattice of spin-1/2 moments with antiferromagnetic exchange interactions. We study both the classical and quantum Heisenberg models on the distorted kagome lattice appropriate for Zn-paratacamite with small $x$. Our theory naturally explains the emergence of the valence bond solid phase. We suggest future inelastic neutron and elastic X-ray scattering experiments that can test our predictions. [1] S.-H. Lee et al., Nature Materials, 6, 853

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