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Spin Supersolid in Anisotropic Spin-One Heisenberg Chain

PINAKI SENGUPTA, CRISTIAN BATISTA, LANL — We consider an $S = 1$ Heisenberg chain with strong exchange ($\Delta = J_z/J_\perp$) and single-ion uniaxial anisotropy (D) in a magnetic field (B) along the symmetry axis. The low energy spectrum is described by an effective $S = 1/2$ XXZ model that acts on two different low energy sectors for a finite range of fields. The vacuum of each sector exhibits Ising-like antiferro magnetic ordering coexisting with the finite spin stiffness obtained from the exact solution of the XXZ model. In this way, we demonstrate the existence of a spin supersolid phase. We also compute the full $\Delta - B$ quantum phase diagram using a quantum Monte Carlo (QMC) method.

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