

Abstract Submitted
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Plaquette order and deconfined quantum critical point in the spin-1 bilinear-biquadratic Heisenberg model on the honeycomb lattice¹

HUI-HAI ZHAO, Institute of Physics, Chinese Academy of Sciences, Beijing, CENKE XU, Department of Physics, University of California, Santa Barbara, Q.N. CHEN, Institute of Theoretical Physics, Chinese Academy of Sciences, Beijing, Z.C. WEI, M.P. QIN, Institute of Physics, Chinese Academy of Sciences, Beijing, G.M. ZHANG, State Key Laboratory of Low-Dimensional Quantum Physics and Department of Physics, Tsinghua University, Beijing, T. XIANG, Institute of Physics and Institute of Theoretical Physics, Chinese Academy of Sciences, Beijing — We have precisely determined the ground state phase diagram of the quantum spin-1 bilinear-biquadratic Heisenberg model on the honeycomb lattice using the tensor renormalization group method. We find that the ferromagnetic, ferroquadrupolar, and a large part of the antiferromagnetic phases are stable against quantum fluctuations. However, around the phase where the ground state is antiferro-quadrupolar ordered in the classical limit, quantum fluctuations suppress completely all magnetic orders, leading to a plaquette order phase which breaks the lattice symmetry but preserves the spin SU(2) symmetry. The quantum phase transition between the antiferromagnetic phase and the plaquette phase is found to be a direct second order transition, being the first candidate of the deconfined quantum critical point for the spin-1 quantum systems.

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