Abstract Submitted
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Phase Diagram of Spin-1/2 Triangular-Lattice Antiferromagnets with Exchange Anisotropy and a Magnetic Field[1] DAISUKE YAMAMOTO, GIACOMO MARMORINI, Condensed Matter Theory Laboratory, RIKEN, IPPEI DANSHITA, Yukawa Institute for Theoretical Physics, Kyoto University — A triangular-lattice spin system is a fundamental model of geometric frustration. Recent experimental developments in magnetic materials synthesis and in frustrated optical lattices of ultracold atoms have renewed interest in studying magnetic properties of ideal two-dimensional frustrated systems over wide range of external field and anisotropy. We study the spin structures of S =1/2 antiferromagnets on a triangular lattice using a large-size cluster mean-field method combined with a scaling scheme. We determine the ground-state phase diagram of the spin model in the plane of magnetic field and XXZ anisotropy, and compare it with the classical counterpart in order to discuss the quantum effects. We find that a nontrivial continuous degeneracy existing in the classical model is broken up into two first-order phase transitions between which a non-classical phase emerges as a result of the selection by quantum fluctuations. We also use the dilute Bose gas expansion in the vicinity of the saturation field and interpret one of the first-order transitions as the 0-π transition of the relative phase between two magnon Bose-Einstein condensates. We suggest that the quantum phase transitions can be observed in current or near-future experiments.

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