

Abstract Submitted
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Spin and quadrupolar orders in the spin-1 bilinear-biquadratic model for iron-based superconductors¹ DAO-XIN YAO, Sun Yat-Sen University, TRINANJAN DATTA, Augusta University, CHENG LUO, Sun Yat-Sen University — Motivated by the recent experimental and theoretical progress of the magnetic properties in iron-based superconductors, we provide a comprehensive analysis of the extended spin-1 bilinear-biquadratic (BBQ) model on the square lattice. Using a variational approach at the mean-field level, we identify the existence of various magnetic phases, including conventional spin dipolar orders (ferro- and antiferromagnet), novel quadrupolar orders (spin nematic), and mixed dipolar-quadrupolar orders. In contrast to the regular Heisenberg model, the elementary excitations of the spin-1 BBQ model are described by the SU(3) flavor-wave theory. By fitting the experimental spin-wave dispersion, we determine the refined exchange couplings corresponding to the collinear antiferromagnetic iron pnictides. We also present the dynamic structure factors of both spin dipolar and quadrupolar components with connections to the future experiments. Reference: Phys. Rev. B 93, 235148 (2016).

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