Abstract Submitted
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Consistent model of magnetism in ferropnictides ALEKSANDER WYSOCKI, KIRILL BELASHCHENKO, Department of Physics and Astronomy and Nebraska Center for Materials and Nanoscience, University of Nebraska-Lincoln, VLADIMIR ANTROPOV, Ames Laboratory — The character of magnetic interactions and spin fluctuations in ferropnictides has until now resisted understanding within any conventional model of magnetism. We show that the most puzzling features can be naturally reconciled within a rather simple effective spin model with biquadratic interaction, which is consistent with electronic structure calculations. While preserving the symmetry of the lattice, this model spin Hamiltonian stabilizes the collinear stripe ground state and generates an anisotropic spin wave spectrum. A natural reinterpretation of the measured spin wave spectra in ferropnictides is presented based on this model. Classical Monte Carlo simulations with experimentally motivated parameters produce reasonable Neel temperatures for 122 compounds. The model predicts that the phase transition to the paramagnetic phase changes from second to first order as the magnitude of the biquadratic term is increased. This property agrees with the observed behavior of the 122 compounds under doping. A clear signature of the separation of the nematic and antiferromagnetic phase transitions is also found. Preprint: arXiv:1011.1715.

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