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Ising-nematic order and spin excitations in the bilinear-biquadratic model for the iron pnictides PATRICIA BILBAO ERGUETA, ANDRIY H. NEVIDOMSKYY, Rice University — Motivated by the recent inelastic neutron scattering (INS) measurements in the iron pnictides which show a strong anisotropy of spin excitations above the Néel temperature [1], we study the frustrated Heisenberg model with a biquadratic spin-spin exchange interaction. Using the Dyson-Maleev (DM) spin representation, which proves appropriate for all temperature regimes, we find that the spin dynamical structure factors are in excellent agreement with experiment, exhibiting spontaneous C_4 lattice symmetry breaking even into the paramagnetic region $T_N < T < T_\sigma$ below the Ising-nematic transition at T_σ. We study the effect of the biquadratic coupling K on the dynamical temperature range $T_\sigma - T_N$ and find that it reduces dramatically for even small values of K and interlayer exchange J_c. We benchmark the results obtained using DM against those from different non-linear spin-wave theories, including the recently developed generalized spin-wave theory [2] and find good qualitative agreement among the different methods, which also fit well the experimental spin-wave dispersions and the dynamical structure factors.
[1] X. Lu, *et al.*, Science **345**, 657 (2014).
[2] R. A. Muniz, Y. Kato, C. D. Batista, arXiv: 1307.7731 (2013).

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