Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Emergent Ising degrees of freedom in the J_1-J_2-J_3 model for the iron tellurides GUANGHUA ZHANG, Ames Laboratory, Dept of Physics and Astronomy, Iowa State University, RAFAEL FERNANDES, School of Physics and Astronomy, University of Minnesota, REBECCA FLINT, Ames Laboratory, Dept of Physics and Astronomy, Iowa State University — The iron-telluride family of superconductors form a double-stripe [$\mathbf{Q} = (\pi/\mathbf{2}, \pi/\mathbf{2})$] magnetic order, which can be captured within a $J_1 - J_2 - J_3$ Heisenberg model in the regime $J_3 \gg J_2 \gg J_1$. Intriguingly, besides breaking spin-rotational symmetry, the ground state manifold has three additional Ising degrees of freedom. Via their coupling to the lattice, they give rise to a monoclinic distortion and to two non-uniform lattice distortions with wave-vector (π, π). Because the ground state is four-fold degenerate (mod rotations in spin space), only two of these Ising order parameters are independent. Here we introduce an effective field theory to treat all Ising order parameters, as well as magnetic order. All three transitions (corresponding to the condensations of two Ising and one magnetic order parameter) are simultaneous and first order in three dimensions, but lower dimensionality (or equivalently weaker interlayer coupling) and weaker magnetoelastic coupling can split the three transitions, and in some cases allows for two separate Ising phase transitions.

Guanghua Zhang
Ames Laboratory, Dept of Physics and Astronomy, Iowa State University

Date submitted: 08 Jan 2016 Electronic form version 1.4