Complex Magnetic Phase Diagrams of Models for Iron Based High-Tc Superconductors

Author: Elbio Dagotto [1,2]

[1]*Department of Physics and Astronomy, University of Tennessee, Knoxville, TN 37996, USA.*
[2]*Materials Science and Technology Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831, USA.*

Abstract: The iron-based high critical temperature superconductors appear to be located in an intermediate coupling regime [1,2], which is difficult to study theoretically with canonical analytical techniques. For this reason computational studies are important in this context. After a brief introduction, I will focus on two broad areas of research: (i) the widely discussed spin nematic state analyzed from the perspective of Monte Carlo simulations of the spin fermion model [3], and (ii) the several competing magnetic states unveiled in quasi one-dimensional two-leg ladder and chain geometries from the perspective of Hartree-Fock and Density Matrix Renormalization Group methods applied to Hubbard models [4]. All these results, and several others, contribute to unveiling an unexpected degree of complexity in the magnetic phase diagrams of iron superconductors.

References:

[1] P. Dai, J.P. Hu, and E. Dagotto, Nat. Phys. **8**, 709 (2012).
[2] E. Dagotto, Rev. Mod. Physics **85**, 849 (2013).
[3] S. Liang et al., PRL **111**, 047004 (2013); S. Liang et al., PRB **90,** 184507 (2014).
[4] Q. Luo et al., PRB **87**, 024404 (2013); J. Rincon et al. PRL **112**, 106405 (2014).