MAR12-2011-002795

Abstract for an Invited Paper
for the MAR12 Meeting of
the American Physical Society

Towards an understanding of magnetic interactions and anisotropies in iron superconductors

ELENA BASCONES, Instituto de Ciencia de Materiales de Madrid (ICMM-CSIC)

The itinerant or strong coupling origin of magnetism in iron pnictides is still unsettled. The localized description generally assumes AF exchange constants satisfying $2J_2 > J_1$, withJ_1 and J_2 referring to first and second nearest neighbors respectively. The itinerant picture relies on the nesting of the Fermi surface. Both descriptions reproduce the columnar ordering found experimentally. The role played by the Hund's coupling J_H and the orbital degree of freedom are also highly debated. Orbital ordering has been invoked to explain the anisotropic resistivity and optical conductivity. We make connection between these two pictures by studying the same five-orbital model within Heisenberg and mean field descriptions [1]. We have found that J_2/J_1 strongly depends on the charge and orbital filling what results in an unexpected sensitivity of the AF ordering to crystal field parameters. J_1 and J_2 can become ferromagnetic at large J_H. Consistent results are obtained in the mean field description. We also analyze the resistivity and optical conductivity anisotropies and show that they are a consequence of magnetism and not of orbital ordering [2].

[1] M.J. Calderón et al, arXiv:1107.2279. E. Bascones et al, PRL 104, 227201 (2010).
[2] B. Valenzuela et al, PRL 105, 207202 (2010).