Interplay of magnetoelastic coupling, nesting and nematicity in the iron arsenide systems

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Abstract

An interesting feature of the iron arsenides is the magnetoelastic coupling between the long wavelength in-plane strains of the lattice and the collective spin fluctuations of the electrons near the magnetic ordering wavevectors. We study the microscopic origin of this feature from an electronic model with nested Fermi pockets and a nominal interaction. We find the couplings diverge with a power-law as the system is tuned to perfect nesting, thereby implying the magnetoelasticity in these systems is a nesting induced feature. We also elucidate how this nesting induced singularity plays a role in triggering a spin fluctuation driven nematic instability that gives rise to the orthorhombic phase of these materials. These results show the microscopic connection between the nesting of the bands with the nematic and the magnetoelastic properties of the iron arsenides.

Refs: [1] I. Paul, arXiv:1312.4968.