Superconductivity from repulsion in LiFeAs: Novel s-wave symmetry and potential time-reversal symmetry breaking

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In my talk I will review the multiband aspects of superconductivity arising from repulsive interaction with weak spin fluctuations. Most importantly, I will analyze the structure of the pairing interaction and superconducting gaps for LiFeAs, which electronic structure and superconducting gaps are well studeid by ARPES. We use the ten-orbital tight-binding model, derived from ab-initio LDA calculations with hopping parameters extracted from the fit to ARPES experiments. We find that the pairing interaction almost decouples between two subsets, one consists of the outer hole pocket and two electron pockets, which are quasi-2D and are made largely out of dxy orbital, and the other consists of the two inner hole pockets, which are quasi-3D and are made mostly out of dxz and dyz orbitals. Furthermore, the bare inter-pocket and intra-pocket interactions within each subset are nearly equal. In this situation, small changes in the intra-pocket and inter-pocket interactions due to renormalizations by high-energy fermions give rise to a variety of different gap structures. Different s-wave gap configurations emerge depending on whether the renormalized interactions increase attraction within each subset or increase the coupling between particular components of the two subsets. We argue that the state with opposite sign of the gaps on the two inner hole pockets has the best overlap with ARPES data.