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Modeling local interface and impurity effects in phase separated iron chalcogenide superconductor $\mathbf{K}_x\mathbf{Fe}_{2-y}\mathbf{Se}_2$ S. MUKHERJEE, M.N. GASTIASORO, University of Copenhagen, P.J. HIRSCHFELD, University of Florida, B.M. ANDERSEN, University of Copenhagen — Superconductivity in iron chalcogenide superconductor $KxFe_{2-y}Se_2$ exists near a phase separated block antiferromagnetic state (BAFM) with magnetic moments of $3.3\mu_B$/Fe. The nature of the superconducting state compared to other pnictide superconductors is unclear because the Fermi surface contains electron pockets only. This raises the fundamental question whether the superconducting phase is described by s- or d-wave gap symmetry. We study the magnetic state, the superconducting state as well as their interface in phase separated $K_xFe_{2-y}Se_2$ using a real space extended Hubbard model. The model includes the effects of all five Fe d-orbitals and the superconducting pairing interaction is generated within the spin-fluctuation exchange mechanism. We propose the existence of signatures in the local density of states near the interface and impurities that could discriminate between the d-wave and s-wave superconducting gap symmetries. Further, we show how the interface between the superconductor and BAFM leads to novel features in the various mean fields, including e.g. a strong interface-enhanced orbital-ordering.

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