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Renormalization group flow, competing phases, and gap structure in multi-band models of Fe-based superconductors ANDREY CHUBUKOV, SAURABH MAITI, University of Wisconsin — We perform an analytical renormalization group (RG) study to address the role of Coulomb repulsion, the competition between extended s-wave superconducting order ($s\pm$) and the spin density wave (SDW) order, and the angular dependence of the superconducting gap in multi-pocket models of Fe-based superconductors. Previous analytic RG studies considered a toy 2-pockets model (one hole and one electron). We consider more realistic models of 4 and 5 pockets (2 electron and 2 or 3 hole pockets), and also incorporate angular dependences of the interactions caused by the transformation from orbital to band description. In a toy 2-pocket model, SDW order always wins over $s\pm$ order at perfect nesting; $s\pm$ order only appears when doping is finite and RG flow extends long enough to overcome intra-pocket Coulomb repulsion. In multi-pocket models, there are two new effects. First, the pairing interaction projected onto $s\pm$ channel has an attractive component no matter how strong intra-pocket repulsion is. Second, in 4-pocket model (but not in 5-pocket model), $s\pm$ order wins over SDW order even for perfect nesting, if parquet RG flow extends long enough, suggesting that SDW order is not a necessary pre-condition for the $s\pm$ order. Our analytic results are in full agreement with recent numerical functional RG studies by Thomale et. al.

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