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**Evolution of symmetry and structure of the gap in Fe-based superconductors with doping and interactions** ANDREY CHUBUKOV, SAURABH MAITI, University of Wisconsin-Madison, MAXIM KORSHUNOV, Russian Academy of Sciences, Siberian branch, THOMAS MAIER, Oak Ridge National Lab., PETER HIRSCHFELD, University of Florida — We present a detailed study of the symmetry and structure of the pairing gap in Fe-based superconductors. We treat them as quasi-2D systems, decompose the pairing interaction into $s-$wave and $d-$wave channels and into contributions from scattering between different Fermi surfaces and analyze how each scattering evolves with doping and input parameters. We verify that each interaction is well approximated by the lowest angular harmonics and use this simplification to analyze the interplay between the interaction with and without spin-fluctuation components, the origin of the attraction in the $s\pm$ and $d_{x^2-y^2}$ channels, the competition between them, the nature of angular dependence of the $s\pm$ gaps along the electron Fermi surface, the conditions under which $s\pm$ gap develops nodes, and the origin of superconductivity in heavily electron- or hole-doped systems, when only Fermi surfaces of one type are present. In particular, we find that with increased electron and hole doping, the competition from $d-$wave grows. In the case of strong hole doping, there is some ambiguity over the leading solution, but in the case of strong electron doping, $d-$wave emerges as clear winner.

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