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The origin of the electron-hole asymmetry of the spin fluctuations and the effect on superconductivity in iron-based superconductors KATSUHIRO SUZUKI, HIDETOMO USUI, KAZUHIKO KUROKI, University of Electro-Communications — Development of the spin fluctuation has been considered as one of the important features in the iron-based superconductors. One of interesting observation is the electron-hole asymmetry in its incommensurability, which appears in the neutron scattering experiments. In the present study, we study the origin of this electron-hole asymmetry, and its effect on the superconducting gap form. We first obtain a 10 orbital model for 122 iron-based superconductors from first principle calculation and obtain 5 orbital model in the unfolded Brillouin zone, which can only be done approximately in 122 systems. We apply the random phase approximation to these models to obtain the spin susceptibility, and solve the Eliashberg equation for the spin-fluctuation-mediated superconductivity. We find that the origin of the electron-hole asymmetry of the spin fluctuations is the multi-orbital nature of the Fermi surfaces. The multi-orbital nature of the Fermi surface is also found to be important in the appearance of horizontal nodes in the superconducting gap found found in the calculation for 122 systems.

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