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Theoretical Study of 3D Superconducting Gap Structure in Iron Based Superconductors TETUSRO SAITO, SEIICHIRO ONARI, HIROSHI KONTANI, Nagoya University — The mechanism and symmetry of the superconducting (SC) gap in Fe-based superconductors have been studied actively, and both the spin fluctuation-mediated $s_{\pm}$-wave SC state and orbital fluctuation-mediated s_{++}-wave SC state had been proposed. To obtain important information on the pairing mechanism, we analyze the Eliashberg gap equation using the 3-dimensional 10-orbital model. When we perform the RPA by considering only the Coulomb interaction, only the spin fluctuations develop, and the SC gap of z^2-orbital dominant part on the hole pockets is almost zero. The resultant horizontal node is inconsistent with several measurements. However, the orbital fluctuations develop by introducing the quadrupole interaction g (due to the vertex correction) and it is found that (i) the horizontal node disappears and (ii) the crossover from $s_{\pm}$-state to s_{++}-state is realized. During the crossover, we obtained the loop-node structures on the electron pockets, which are actually observed by ARPES measurements in $BaFe_2(As,P)_2$. We expect that optimally doped $BaFe_2(As,P)_2$ is in the crossover regime between s_{++}-state and $s_{\pm}$-state.

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