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Spin resonance peak in the superconducting state of iron-based materials

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Multiband systems, which possess a wide parameter space, allow to explore a variety of competing ground states. Bright examples are the iron-based pnictides and chalcogenides, which demonstrate metallic, superconducting, and various magnetic phases. The superconducting state is unconventional and thus the system demonstrates unusual spin response with the spin resonance feature that can be observed in the inelastic neutron scattering experiments. Here, the spin resonance in the superconducting state of Fe-based materials within the multiorbital model with unequal anisotropic gaps on different Fermi surface sheets is discussed. On the basis of the model gap function and the one calculated within the spin fluctuation theory of pairing, we show that the resonance peak shifts to higher frequencies with increasing the zero-amplitude gap magnitude. On the contrary, with increasing the gap anisotropy, it shifts to lower frequencies and loses some intensity. Obtained results lead to the adjustment of the condition that allows us to make a comparison of experimental data on the peak frequency and gaps to answer the question on whether the observed peak is the true spin resonance originating from the s± state.

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