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## Josephson current in d-wave superconductor junctions with inhomogeneous ferromagnet

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We study Josephson effect in a junction with arbitrarily oriented d-wave superconducting electrodes connected through two ferromagnets with noncollinear magnetizations. We solve the scattering problem based on the Bogoliubov-de Gennes formalism, extended to the case of anisotropic superconductors and presence of spin flip scattering due to ferromagnet interlayer. We investigate mutual influence of crystal orientation of superconducting electrodes and angle  $\alpha$  between magnetizations in ferromagnetic bilayer of thickness  $d$  by calculating critical value of Josephson current  $I_C$ . For various orientation of superconducting electrodes, we calculate  $(d, \alpha)$  phase diagram, and discuss the possibility to achieve except coexistence of two stable states  $0$  and  $\pi$ , also coexistence of three stable states  $0$ ,  $\pi$  and  $\pi/2$ , by varying the angle between magnetizations which can be much better for application compared to varying thickness of barrier or temperature. In the crossover point triply degenerate  $0$ ,  $\pi/2$  and  $\pi$  equilibrium states occur, the fourth harmonic have dominant contribution and  $I \sim \sin 4\phi$ , in the same way as in SFS junction where second harmonic have dominant contribution in  $0$ - $\pi$  crossover point. We observe also areas of coexistence of stable and metastable states.

**Reference:**

1. Stevan Djurdjević and Zorica Popović, Prog. Theor. Exp. Phys. 2021, 083I02 (2021).

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