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Crossover from clean to dirty limit in Josephson junctions with inhomogeneous ferromagnet¹ ZORAN RADOVIC, LUKA TRIFUNOVIC, ZORICA POPOVIC, Department of Physics, University of Belgrade, POB 368, 11001 Belgrade, Serbia — We study the Josephson effect and pairing correlations in SFFS junctions with two metallic monodomain ferromagnets with transparent and spin-inactive interfaces. We solve the Eilenberger equations self-consistently for arbitrary relative orientation of magnetizations of the two F layers in the clean limit and for moderate disorder in ferromagnets. Spatial variation of singlet and odd-frequency triplet pair amplitudes, as well as the Josephson current-phase relations, are calculated for different values of the ferromagnetic layer thickness and the angle between in-plane magnetizations. In the clean limit we find that both spin singlet and triplet pair amplitudes in F layers show a similar oscillatory decay with distance from the SF interfaces. For the singlet pair amplitude this decay gets faster as the impurity-scattering rate in ferromagnets is increased while the triplet amplitudes remain practically unaffected. In the dirty limit, the singlet amplitude penetrates into the ferromagnet over a short length scale determined by the exchange energy, while the triplet amplitudes are not suppressed and consequently they are long-ranged.

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