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Josephson effect in S/F/S junctions: spin bandwidth asymmetry vs. Stoner exchange HENRIK ENOKSEN, Norwegian University of Science and Technology, GAETANO ANNUNZIATA, Universita di Salerno, JACOB LINDER, Norwegian University of Science and Technology, MARIO CUOCO, CANIO NOCE, Universita di Salerno, ASLE SUDBO, Norwegian University of Science and Technology — We analyze the dc Josephson effect in a ballistic S/F/S junction in the quasiclassical Andreev approximation. We consider the possibility of ferromagnetism originating from a mass renormalization of carriers of opposite spin, i.e. a spin bandwidth asymmetry (SBAF). We provide a general formula for Andreev levels which is valid for arbitrary interface transparency, exchange interaction, and bandwidth asymmetry. We analyze the current-phase relation, the critical current, and the free energy in the short junction regime, showing that a larger number of $0 - \pi$ transitions is expected when the ferromagnetism is driven by SBAF compared to Stoner magnetism. We compare the phase diagrams of two identical junctions differing only in the mechanism by which the mid layer becomes magnetic, pointing out that the phase difference across the junction in the ground state need not be the same, even for equal polarizations.

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