SUPERCURRENT INTERFERENCE PATTERNS IN MULTIFACET SIFS 0-π JOSEPHSON JUNCTIONS

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We study the critical current I_c dependence on applied magnetic field H for Superconductor-Insulator-Ferromagnet-Superconductor Josephson junctions [1] consisting of interchanging 0 and π segments of equal lengths. The common theoretical approach [2], which assumes the uniform flux density *B*, predicts that: (a) $I_c(H)$ has main maxima when the flux per segment is equal to half a flux quantum; (b) the other maxima of $I_c(H)$ are much lower and almost symmetric relative to the main one; (c) the height of the main peaks is $0.63I_{c0}$, where $I_{c0} = j_c wL$ is the intrinsic critical current, *w* and *L* are the junction's width and length. In experiment, however, the secondary maxima between the two main maxima almost vanish and the main maxima of I_c are lower than expected. We demonstrate that these features of are caused by a non-uniform flux density *B* resulting from screening currents in the electrodes in the presence of a (parasitic) off-plane field component. The results reported here also may explain inconsistent experimental data obtained earlier on NCCO-NB ramp zigzag 0-π junctions [3].

References

[1] M. Weides, M. Kemmler, H. Kohlstedt, R. Waser, D. Koelle, R. Kleiner, E. Goldobin, *0-π Josephson Tunnel Junctions with Ferromagnetic Barrier*, Phys. Rev. Lett. **97**, 247001 (2006).

[2] H.-J. H. Smilde, Ariando, D. H. A. Blank, G. J. Gerritsma, H. Hilgenkamp and H. Rogalla, *d-Wave-Induced Josephson Current Counterflow in $YBa_2Cu_3O_7$/Nb Zigzag Junctions*, Phys. Rev. Lett. **88**, 057004, (2002).

[3] Ariando, D. Darminto, H. -J. H. Smilde, V. Leca, D. H. A. Blank, H. Rogalla and H. Hilgenkamp, *Phase-Sensitive Order Parameter Symmetry Test Experiments Utilizing $Nd_{2-x}Ce_xCuO_{4-y}$/Nb Zigzag Junctions*, Phys. Rev. Lett. **94** 167001 (2005).