Antiphase magnetic proximity effect in $YBa_2Cu_3O_7$ / $La_{2/3}Ca_{1/3}MnO_3$ multilayers

Ch. Niedermayer, J. Stahn, J. Hoppler, T. Gutberlet, C. Schanzer, M. Ay
Laboratory for Neutron Scattering, ETHZ and PSI

C. Bernhard, J. Chakhalian, G. Christiani, H.-U. Habermeier, B. Keimer
Max Planck Institut für Festkörperforschung, Stuttgart, Germany

E. Kenzinger, U. Rücker
Institut für Festkörperforschung, Jülich, Germany

Multilayers of superconducting/ferromagnetic $YBa_2Cu_3O_7/La_{2/3}Ca_{1/3}MnO_3$ have been studied by polarized neutron reflectometry. The occurrence of a structurally forbidden Bragg peak in the FM state highlights a significant difference between the nuclear and magnetic depth profiles. From comparison with simulated reflectivity curves we identify two possible magnetization profiles: (i) a magnetic moment within the superconducting layer antiparallel to the one in the ferromagnetic layer (antiphase magnetic proximity effect) or (ii) a “dead” region in the ferromagnetic layer with zero net magnetic moment. In addition, we observe an anomalous enhancement of the off-specular reflection in the superconducting state which signals a strong mutual interaction between superconducting and ferromagnetic order parameters.