

# Spin screening effect in superconductor/ferromagnet thin film heterostructures studied using nuclear magnetic resonance

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## Abstract

Using NMR spectroscopy of the  $V\ 51$  nuclei in the superconducting state of Ni/V/Ni and Pd $_{1-x}$ Fex /V/ Pd $_{1-x}$ Fex trilayers we reported in a recent letter an experimental observation of the spin screening effect. This effect, which designates the formation of a spin polarization in the superconducting state, was predicted previously by Bergeret. Here, we extend our earlier experiments by varying the thickness of the superconducting V layer and by applying the magnetic field not only perpendicular to the film plane as in the previous experiments, but also in the parallel direction. For the latter geometry, which for experimental reasons is difficult to realize, the film is in the vortex-free state. This allows a direct quantitative comparison of the experimental screening effect as derived from a characteristic distortion of the high-field wing of the resonance line in the superconducting state and the theoretical model calculations. We derive a reasonable agreement between theory and experiment, confirming the spin screening effect in the superconductor. © 2009 The American Physical Society.

<http://dx.doi.org/10.1103/PhysRevB.80.214523>

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