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A spin valve core structure based on the fulde-ferrell larkin-ovchinnikov like state: Studies on bilayers and trilayers of superconductors and ferromagnets

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Abstract

Interference effects of the superconducting pairing wave function in thin film bilayers of Nb as a superconductor (S) and Cu41Ni59 as ferromagnetic (F) material lead to critical temperature oscillations and reentrant superconductivity for increasing F-layer thickness. The phenomenon is generated by the Fulde-Ferrell Larkin-Ovchinnikov (FFLO) like state establishing in these geometries. So far detailed investigations were performed on S/F bilayers. Recently, we could also realize the phenomena in F/S bilayers where the S-metal now is grown on top of the F-material. Combining both building blocks yields an F/S/F trilayer, representing the core structure of the superconducting spin valve. Also for this geometry we observed deep critical temperature oscillations and reentrant superconductivity, which is the basis to obtain a large spin switching effect, i.e. a large shift in the critical temperature, if the relative orientation of the magnetizations of the F-layers is changed from parallel to antiparallel.

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