A Superconducting Spin Valve Core Structure based on the FFLO Like State: Studies on Bilayers and Trilayers of Superconductors and Ferromagnets

V.I. Zdravkov[a, b], J. Kehrle[a], G. Obermeier[a], C. Müller[a], R. Morari[a, b], A.S. Sidorenko[a], S. Horn[a], R. Tidecks[a], and L.R. Tagirov[a, c]

[a]Institut für Physik, Universität Augsburg, D-86159 Augsburg, Germany
[b]Institute of Electronic Engineering and Nanotechnologies ASM, MD 2028 Kishiniev, Moldova
[c]Solid State Physics Department, Kazan Federal University, 420008 Kazan, Russia

Interference effects of the superconducting pairing wave function in thin film bilayers of Nb as a superconductor (S) and $Cu_{41}Ni_{59}$ 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.[1] 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.[2] 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.

[1]V. I. Zdravkov, J. Kehrle, G. Obermeier, *et al.*, Phys. Rev. B **82**, 054517 (2010).
[2]L. R. Tagirov, Phys. Rev. Lett. **83**, 2058 (1999).