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Exploring triplet superconductivity by controlling the magnetic non-collinearity L.Y. ZHU, YAOHUA LIU, MSD, Argonne National Laboratory, F.S. BERGERET, Centro de Física de Materiales, Centro Mixto CSIC-UPV/EHU, Donostia International Physics Center, J.E. PEARSON, S.G.E. TE VELTHUIS, S.D. BADER, J.S. JIANG, MSD, ANL — Recent theories predict spin-triplet superconductivity at the interface between a singlet superconductor (SC) and a ferromagnet (FM) with *inhomogeneous* magnetization [1]. Magnetic non-collinearity is a crucial but not quantitatively controlled parameter in most experiments inferring triplet superconductivity [2]. In this work, we use Nb as the SC, and an epitaxial exchange spring Py/Sm-Co bilayer with in-plane uniaxial anisotropy in Sm-Co layer as the FM. Due to the interfacial exchange coupling, a *tunable* noncollinear spin spiral can be achieved by controlling the external field. At a fixed temperature within the superconducting transition, starting from a collinear magnetic configuration, as the spin spiral winding angle ϕ increases, the superconducting critical current (I_c) first increases. There is an optimized winding angle ϕ_o, which maximizes I_c, after which I_c decreases with increasing ϕ. This *non-monotonic* $I_c(\phi)$ dependence cannot be explained by the short range proximity effect alone and suggests triplet pairing. More importantly, combining micromagnetic simulations with magnetoresistance measurements, we have determined the magnetic non-collinearity and correlated it *quantitatively* with the superconducting transport results. Our findings demonstrate the superconducting proximity effect can be tuned by manipulating the magnetic non-collinearity in a *single* sample.
[1] F. S. Bergeret et al., PRL **86**, 4096. [2] M. Eschrig, Physics Today **64**, 43.

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