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Probing the magnetic states in a ferromagnet using a superconductor LEYI ZHU, TINGYONG CHEN, CHIA-LING CHIEN, Department of Physics and Astronomy, Johns Hopkins University — In a superconductor (S)/ferromagnet (F) bilayer, the superconducting properties of the S layer are sensitive to the domain pattern in the adjacent F layer.[1-2] We exploit this effect to investigate Ni films, which instead of retaining in-plane anisotropy as usual, unexpectedly acquire perpendicular anisotropy when the thickness is above a critical value. Using Ni/Nb bilayers, the perpendicular magnetization component can be sensitively probed by the measurements of the superconducting transition of Nb in a magnetic field, which alters the domain pattern in Ni. Above the critical Ni thickness, an in-plane magnetic field can manipulate the stripe domains in Ni between parallel stripes and random labyrinth states resulting in as much as 90 mK in the transition temperature of the Nb layer. This clearly demonstrates that superconductor is a sensitive probe of the magnetic domain state of a ferromagnet. In turn, the results also show that along the parallel stripe domains, superconductivity is less detrimental. [1]. A. Yu. Rusanov, M. Hesselberth, J. Aarts, and A. I. Buzdin, Phys. Rev. Lett. 93, 057002 (2004). [2]. L. Y. Zhu, T. Y. Chen, and C. L. Chien, Phys. Rev. Lett. 101, 017004 (2008).

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