Abstract Submitted for the MAR09 Meeting of The American Physical Society

## **Re-entrant**

## resistance

in mesoscopic superconductor-ferromagnet-superconductor structures<sup>1</sup> MADALINA COLCI, MARTIN STEHNO, DALE VAN HARLINGEN, University of Illinois at Urbana-Champaign — We report measurements of the resistance as a function of temperature and magnetization alignment in hybrid structures consisting of superconducting electrodes connected by two ferromagnetic nanowires separated by less than a superconducting coherence length. It has been predicted that such structures could exhibit a supercurrent due to Cooper pair splitting and coherent transport through the ferromagnets. Although we have not observed a zero-voltage supercurrent, we find that as the temperature is lowered below the critical temperature of the superconductor, the resistance of the structure shows a minimum and then rises, suggestive of re-entrant behavior. The resistance of the antiparallel alignment of the magnetization of ferromagnetic wires is found to be lower than in the parallel case just below Tc but becomes distinctly larger than in the parallel case at the lowest temperature. We discuss possible explanations and implications of this result.

<sup>1</sup>Work supported by NSF grant DMR06-05813

Madalina Colci University of Illinois at Urbana-Champaign

Date submitted: 21 Nov 2008

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