Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Spin Transport and Spin Transfer in a Current-Perpendicular-to-the-Plane-Device with a Nanocontact Current Concentrator OZHAN OZATAY, NATHAN C. EMLEY, PATRICK M. BRAGANCA, GREGORY D. FUCHS, ROBERT A. BUHRMAN, Cornell University, Applied Physics, NY — CPP GMR devices allow the effective study of spin-dependent transport in nanomagnets. CPP devices may also be the only viable option for magnetic read head sensors for ultra-high density storage since the impedance level of nanoscaled magnetic tunnel junctions is likely to become too large to be effective. However, edge effects in nanoscale CPP device structures can substantially degrade the magnetoresistance, and the impedance level of even a nanoscale all-metallic CPP device may be considerably less than the optimum. We have developed a novel nanocontact technique whereby a $\sim$ 3 nm aluminum oxide barrier layer is inserted in the midst of the Cu spacer of a $\sim$ 100 nm diameter CPP spin valve. This barrier layer is patterned with e-beam lithography followed by an in-situ ion milling and deposition process to form an intentional metallic pinhole, $\sim$ 10-20 nm in diameter. This design concentrates the current flow away from the device edges, increases the device impedance, and may potentially decrease the current required for spin transfer switching of a nanomagnet.

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Date submitted: 06 Dec 2004 Electronic form version 1.4