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Spin-Transfer switching with short current pulses in all perpendicular spin valve nanopillars HUANLONG LIU, New York University, DANIEL BEDAU, JEAN-JACQUES BOUZAGLOU, ANDREW KENT, JONATHAN SUN, JORDAN KATINE, ERIC FULLERTON, STEPHANE MANGIN, NEW YORK UNIVERSITY TEAM, IJL, NANCY-UNIVERSITY TEAM, IBM T.J. WATSON RESEARCH CENTER TEAM, SAN JOSE RESEARCH CENTER, HITACHI-GST TEAM, CMRR, UNIVERSITY OF CALIFORNIA, SAN DIEGO TEAM — Spin-transfer switching has been studied in spin-valves with perpendicularly magnetized free and reference layers and a lateral size of 100 nm x 100 nm. We demonstrate 100% switching probability with high efficiency for current pulses as short as 300 ps, comparable to the magnetization precession time. Experimentally we find that the inverse reversal time $1/\tau = A(I - I_{c0})$ depends linearly on the current overdrive, where I_{c0} is the zero temperature critical current. The dynamic parameter A depends linearly on the applied easy-axis field, as predicted by a $T = 0$ macrospin model for a magnet with uniaxial anisotropy. However, A depends on the applied field much more strongly than predicted by the model. To fit the data we must assume a large initial angle of the magnetization of the free layer. Possible explanations for the discrepancies are a breakdown of the macrospin picture because of domain wall nucleation or propagation. Supported by USARO (Grant No. W911NF0710643).

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