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The dynamics of field and current-driven magnetic domain wall depinning[1] GEOFFREY BEACH, UT Austin, CARL KNUTSON, MAXIM TSOI, JAMES ERSKINE — The depinning of a magnetic domain wall from a well-defined potential well was studied experimentally on timescales ranging from minutes down to tens of nanoseconds. At longer timescales, the behavior follows the classical Neel-Brown model of thermal activation, one of the few observations of this process for the ideal case of a single energy barrier. Below one microsecond, however, the depinning rate becomes independent of the activation volume and assumes a more universal behavior. This transition is due to a vanishing of the energy barrier at a critical field, beyond which the rate of depinning depends primarily on the torque supplied by the field and spin current. A dc spin-polarized current flowing across the domain wall has the effect of lowering the energy barrier by an amount that is predominantly quadratic in current, independent of its direction. This is seen to arise from a shift of the wall in the energy potential due to the adiabatic component of spin-transfer torque.

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