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Domain wall motion driven by an electric current JIEXUAN HE, ZHANJIE LI, SHUFENG ZHANG, University of Missouri Columbia — We have recently proposed [1] that an electric current in a ferromagnetic film generates two mutually orthogonal spin torques, $\boldsymbol{\tau}_1 = b_J \mathbf{M} \times (\mathbf{M} \times \frac{\partial \mathbf{M}}{\partial x})$ and $\boldsymbol{\tau}_2 = c_J \mathbf{M} \times \frac{\partial \mathbf{M}}{\partial x}$ where $\mathbf{M}$ is the magnetization vector and the constants b_J and c_J are proportional to the current density. By including these two spin torques in the Landau-Lifshitz-Gilbert equation; we have simulated the domain motion in a number of experimentally accessible geometries. We have found that the current-driven domain wall motion displays many unique features compared to that driven by an external field. One particular example is to predict the critical current as a function of the applied magnetic field in a "constriction" geometry where the domain wall is originally trapped before applying an electric current. The calculated critical current densities are compared to the existing experimental data. [1] S. Zhang and Z. Li, Phys. Rev. Lett. **93**, 127204 (2004).

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