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High speed domain wall motion in MgO-based magnetic tunnel junctions driven by perpendicular current injection[1] P.J. METAXAS, A. CHANTHBOUALA, R. MATSUMOTO, V. CROS, A. ANANE, J. GROLLIER, A. FERT, Unite Mixte de Physique CNRS/Thales, France, K.A. ZVEZDIN, Istituto P.M. s.r.l., Italy, A. FUKUSHIMA, S. YUASA, National Institute of Advanced Industrial Science and Technology (AIST), Japan — The ability to efficiently drive fast domain wall (DW) motion will pave the way for revolutionary new electronic devices ranging from DW-MRAMs to spintronic memristors. The majority of domain wall devices use a lateral, current-in-plane configuration in which critical current densities for domain wall motion remain quite high, typically being on the order of 100 MA/cm^2 with velocities generally limited to about 100 m/s. In this contribution we show that critical current densities can be decreased by up to two orders of magnitude using the current-perpendicular-to-plane geometry. Indeed, we demonstrate that a DW can be propagated back and forth along the free layer of a MgO-based magnetic tunnel junction (MTJ) in the absence of an external magnetic field using current densities that are on the order of 5 MA/cm^2. More notably however, we obtain high domain wall velocities for these low current densities: the MTJ's large resistance variations allow us to carry out time-resolved measurements of the wall motion from which we evidence DW velocities exceeding 500m/s.

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