Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Current driven asymmetric domain wall propagation CHIRAG GARG, Max Planck Institute for Microstructure Physics, Halle, AAKASH PUSHP, TIMOTHY PHUNG, SEE-HUN YANG, BRIAN P. HUGHES, CHARLES RETTNER, IBM Almaden Research Center, San Jose, California, STUART S.P. PARKIN, Max Planck Institute for Microstructure Physics, Halle — In ultrathin magnetic heterostructures, the presence of spin-orbit coupling gives rise to chiral Neel walls which are stabilized by the Dzyaloshinskii-Moriya Interaction (DMI), and also to a highly efficient chiral spin torque mechanism. In straight nanowires, the current-driven propagation of alternating Néel DWs without the presence of an in-plane field is equivalent, leading to the lock-step motion of several DWs in a nanowire. Here, we show that by engineering the structure in which the domain walls propagate, which in our case is in the shape of a Y-shaped junction, the DW propagation process becomes selective to the polarity of the DWs even in the absence of any externally applied magnetic fields. We remarkably find that after splitting at the Y-shaped junction, the DW velocity in one branch remains largely unaffected compared to its initial velocity whereas simultaneously the DW velocity in the other branch decreases by as much as 10-90%. We show that this large change in the DW velocity in a particular branch depends on the relative angle between the local magnetization of the DW and the spin current emanating from the underlying heavy-metal layer in these nanowires.

Chirag Garg
Max Planck Institute for Microstructure Physics, Halle

Date submitted: 14 Nov 2015 Electronic form version 1.4