Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Skyrmions in thin-film multilayers with interfacially-induced Dzyaloshinskii-Moriya interaction observed by MFM MIRKO BACANI, MIGUEL A. MARIONI, JOHANNES SCHWENK, SARA ROMER, XUE ZHAO, ALEXANDRE GUILLER, Empa, Duebendorf, Switzerland, HANS J. HUG, Empa, Duebendorf, Switzerland and Department of Physics, University of Basel, Basel, Switzerland — By proper selection of interfaces in thin-film multilayers one can separately engineer the anisotropy, magnetization and Dzyaloshinskii-Moriya interaction (DMI), which is useful in the design of skyrmion materials. We use high-sensitivity, high-resolution magnetic force microscopy (MFM) in various applied magnetic fields to image the micromagnetic structures in multilayers based on symmetric-interface stacks of Pt/Co/Pt and asymmetric ones of Pt/Co/Ir. The former have domain sizes of several microns, whereas the latter show considerably smaller domain sizes. These are (246±40) nm independently of the demagnetization process used. We attribute the lower domain size to a net DMI. The calculated DMI in the asymmetric case is too small to support a skyrmion phase, but isolated skyrmions can exist. MFM experiments reveal skyrmions with a diameter below 50 nm, when the field is reduced from positive saturation. In negative fields these skyrmions are either incorporated into expanding domains or burst into a larger domain. Local DMI constants estimated from the bursting fields agree well with the average DMI constant. Our work demonstrates that MFM can detect skyrmions in thin films, and can help accelerate research in this field.

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Date submitted: 05 Nov 2015 Electronic form version 1.4