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Manipulation of Magnetization States of Permalloy Nanorings by an External Azimuthal Field¹ TIANYU YANG, NIHAR PRADHAN, ABBY GOLDMAN, MOUREEN KEMEI, ABBEY LICHT, YIHAN LI, MARK TUOMINEN, University of Massachusetts Amherst, KATHERINE AIDALA, Mount Holyoke College — This experimental research investigates a new method of manipulating the magnetic states of ferromagnetic nanorings using a circular magnetic field directed along the ring circumference. This type of azimuthal field can naturally select a vortex magnetization of desired chirality. The understanding of the magnetization switching behavior in an azimuthal field could lead to new designs of practical magnetic data storage devices. Symmetric and asymmetric nanorings made of permalloy are fabricated by a standard technique using electron-beam lithography and e-beam evaporation. Azimuthal fields are generated by passing current through an atomic force microscope tip, which is positioned at the center of the ring. The magnetic field direction and magnitude are controlled by the current. We demonstrate control over switching from an onion state to a vortex state, and also between two vortex states, using magnetic force microscopy to image the resulting magnetic states.

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