Abstract Submitted
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A new class of aperiodic, long-range ordered artificial spin ices based upon Fibonacci distortions of 2D periodic lattices[1] JUSTIN WOODS, University of Kentucky, VINAYAK BHAT, Technical University of Munich, BARRY FARMER, University of Kentucky, JOSEPH SKLENAR, Northwestern University, ERIC TEIPEL, University of Kentucky, JOHN KETTERSON, Northwestern University, J. TODD HASTINGS, LANCE DE LONG, University of Kentucky — Artificial spin ice (ASI) systems are composed of nanoscale ferromagnetic segments whose shape anisotropy dictates they behave as mesoscopic Ising spins. Most ASI have segments patterned on periodic lattices and a single vertex topology. We have continuously distorted 2D honeycomb and square lattices such that the pattern vertex spacings follow a Fibonacci chain sequence along primitive lattice directions. The Fibonacci distortion is related to the aperiodic translational symmetry of 2D artificial quasicrystals1 that cannot be viewed as continuous distortions of periodic lattices due to their forbidden (e.g., fivefold) rotational symmetries. In contrast, Fibonacci distortions of 2D periodic lattices can be "turned on" by control of the ratio of two lattice parameters d1 and d2. Distortions alter film segments such that pattern vertices are no longer equivalent and traditional spin ice rules are no longer strictly valid. We have performed OOMMF simulations of magnetization reversal for samples having different levels of distortion, and found the magnetic reversal to be dramatically slowed by small distortions ($d1/d2 \approx 1$).

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Justin Woods
University of Kentucky

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