Abstract Submitted
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First observation of ferromagnetic order in an artificial 2D quasicrystal[1] BARRY FARMER, VINAYAK BHAT, University of Kentucky, Department of Physics and Astronomy, ANDREW BALK, JOHN UNGURIS, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, LANCE DE LONG, University of Kentucky, Department of Physics and Astronomy — Magnetic order in bulk quasicrystals is not well understood and known materials exhibit short-range, spin-glass order. We patterned ferromagnetic (FM) thin films into artificial quasicrystals, a new class of metamaterials that exhibits complex magnetic reversal and dynamics that can be controlled via tiling design.[2] We analyzed two-dimensional SEMPA images of magnetization textures of Penrose P2 tilings (P2T) patterned into Permalloy. The diverse, asymmetric vertex coordinations drive novel, *non-stochastic switching* and *complex spin-ice* behaviors that reflect the influence of vertex domain wall energies. Monte Carlo and OOMMF simulation analyses of SEMPA images of slowly grown, never-field-cycled P2T reveal low energy, long-range ordered sublattices that form building blocks of a ground state. A fully ordered ground state is unresolved without long-range dipolar interactions that stabilize a magnetically ordered state with a net moment. Our P2T constitute a set of quasicrystalline metamaterials in which frustration and magnetic order among classical Ising spins can be directly studied.

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[2]V.S. Bhat*, et al. Phys. Rev. Lett.* **111**, 077201 (2013).

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