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Emergent thermal kinetic behavior of artificial spin ice YUYANG LAO, MOHAMMED SHEIKH, JOSEPH SKLENAR, DANIEL GARDEAZABAL, University of Illinois at Urbana-Champaign, JUSTIN WATTS, ALAN ALBRECHT, CHRIS LEIGHTON, University of Minnesota, ANDREAS SCHOLL, Lawrence Berkeley National Laboratory, GIA-WEI CHERN, University of Virginia, KARIN DAHMEN, University of Illinois at Urbana-Champaign, CRISTIANO NISOLI, Los Alamos National Laboratory, PETER SCHIFFER, University of Illinois at Urbana-Champaign — Artificial spin ice systems are two dimensional arrays of single-domain nanomagnets designed to study frustration phenomena. By careful choice of the geometry of the system, the lattices can have ground states with non-trivial degeneracy. We study the kinetics of such systems through photoemission electron microscopy (PEEM) measurements of the fluctuations of the individual nanomagnet moments, looking at excitations above the magnetic ground states of the systems and how those excitations are impacted by lattice geometry. Detailed analysis of different systems shows non-trivial kinetics that originate from different interaction patterns. The study indicates the important role of effective excitation in the near-ground-state kinetics of these frustrated systems. This work was funded by the US Department of Energy under grant number DE-SC0010778. The work of M.S. and K.D. was supported by DOE DE-FE0011194. Work at UMN was supported by the NSF MRSEC under DMR-1420013, and DMR-1507048. The work of C.N. was carried out under the auspices of the US Department of Energy at LANL under contract number DE-AC52-06NA253962. The ALS was supported by the US Department of Energy under contract number DE-AC02-05CH11231.

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