

D. T. Robb, Y. H. Xu, O. Hellwig, J. McCord, A. Berger, M. A. Novotny, and P. A. Rikvold. "Evidence for a dynamic phase transition in [CoPt]<sub>3</sub> magnetic multilayers." *Physical Review B* (2008) 78, 134422. 11 pages.

**Abstract.** A dynamic phase transition (DPT) with respect to the period  $P$  of an applied alternating magnetic field has been observed previously in numerical simulations of magnetic systems. However, experimental evidence for this DPT has thus far been limited to qualitative observations of hysteresis loop collapse in studies of hysteresis-loop area scaling. Here, we present significantly stronger evidence for the experimental observation of this DPT in a [Co(4 Å)Pt(7 Å)]<sub>3</sub>-multilayer system with strong perpendicular anisotropy. We applied an out-of-plane time-varying (sawtooth) field to the [CoPt]<sub>3</sub>-multilayer in the presence of a small additional constant field,  $H_b$ . We then measured the resulting out-of-plane magnetization time series to produce nonequilibrium phase diagrams (NEPDs) of the cycle-averaged magnetization,  $Q$ , and its variance,  $\sigma^2(Q)$ , as functions of  $P$  and  $H_b$ . The experimental NEPDs are found to strongly resemble those calculated from simulations of a kinetic Ising model under analogous conditions. The similarity of the experimental and simulated NEPDs, in particular the presence of a localized peak in the variance in the experimental results, constitutes strong evidence for the presence of this DPT in our magnetic multilayer samples. Technical challenges related to the hysteretic nature and response time of the electromagnet used to generate the time-varying applied field precluded us from extracting meaningful critical scaling exponents from the current data. However, based on our results, we propose refinements to the experimental procedure which could potentially enable the determination of critical exponents in the future.