Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Experimental Observation of Dynamic Phase Transitions in uniaxial Co-Films ANDREAS BERGER, OLATZ IDIGORAS, CIC nanoGUNE, PAOLO VAVASSORI, CIC nanoGUNE and IKERBASQUE Foundation — We studied the time dependent magnetic reversal behavior of uniaxial films in the vicinity of the dynamic phase transition (DPT) as a function of the period P and bias H_b of an oscillating magnetic field. For our experiments, we have used Co-films with in-plane orientation of the uniaxial magneto-crystalline anisotropy axis to avoid complications due to long-range magneto-static interactions. Correspondingly, we have grown 30 nm thick Co-films that exhibit (10-10) surface orientation by means of suitable growth sequences and deposition conditions [1]. For the dynamic field response experiments, we utilized a home-built high-sensitivity magneto-optical Kerr effect set-up, which allowed for real-time low-noise hysteresis loop measurements with P as small as 0.580 ms. Our experiments reveal in addition to the DPT at a critical period P_c, the occurrence of transient dynamic behavior for $P < P_c$ [2]. Our data are consistently explained by a phase line at $H_b = 0$ for $P < P_c$, which causes a first order phase transition in between two antiparallel dynamic order states, thus indicating far-reaching similarities of the DPT to equilibrium phase transitions [2]. However, we also observe anomalies, such as unusual fluctuation pattern in the P-H_b plane, which might be related to the recently suggested occurrence of dynamically "dead" surfaces [3]. References: [1] O. Idigoras et al., J. Appl. Phys. **115,** 083912 (2014); [2] A. Berger et al., Phys. Rev. Lett. **111**, 190602 (2013); [3] H. Park and M. Pleimling, Phys. Rev. Lett. **109**, 175703 (2012).

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Date submitted: 30 Oct 2014 Electronic form version 1.4