Abstract Submitted
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Emergent 1/f noise in collections of individually oscillating magnetic dots[1] BARRY COSTANZI, E DAN DAHLBERG, Univ of Minnesota - Twin Cities — We experimentally demonstrate an emergent $^1/_f$ spectrum from a superposition of the noise from random telegraph noise (RTN) oscillators. The system consists of individual square magnetic permalloy dots with dimensions on the order of 200nm x 200nm x 10nm that exhibit RTN in their magnetization at appropriate applied fields. The magnetization fluctuations are measured by the anisotropic magnetoresistance (AMR). AMR is used to find applied fields necessary to exhibit RTN, which result in Lorentizan spectra in the power spectral density of the measurement. A composite AMR measurement of multiple oscillating dots at once, however, shows an emergent $^1/_f$ spectrum in the power spectral density. This agrees with the prediction of Van Der Ziel [1] that, for an appropriate distribution of oscillators showing Lorentzian spectra, the composite spectrum will have a $^1/_f$ character. This experimental demonstration of $^1/_f$ noise from a system of two-state oscillators indicates a possible mechanism for the origin of $^1/_f$ spectra observed in both other magnetic systems, and potentially in other, more disparate systems. [1] A. van der Ziel, Physica **16**, 359 (1950).

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