Abstract Submitted
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Origin of 1/f noise found in ensembles of random telegraph noise oscillators[1] BARRY COSTANZI, St Olaf College, DAN DAHLBERG, University of Minnesota — We experimentally observe 1/f noise appearing as an aggregate of $1/f^2$ signals from magnetic nanodots undergoing random telegraph noise (RTN) oscillations in their magnetizations. 250nm square permalloy dots (10nm thick) exhibit RTN in magnetization at the appropriate applied fields, and these fluctuations are measured in individual dots through the anisotropic magnetoresistance. The RTN in the resistance results in a Lorentzian power spectral density (PSD). Measuring multiple oscillating dots at once, however, shows an emergent 1/f PSD, in agreement with the van der Ziel theory [1] which predicts an aggregate 1/f spectrum for an appropriate distribution of Lorentzian spectra. Our collections of dots exhibit the necessary energy distributions predicted by the van der Ziel theory, but this emergent behavior can be observed for as few as two RTN oscillators, significantly softening Van der Ziel's requirement of a broad distribution of Lorentzians for 1/f to emerge. The RTN fluctuations are as small as one part in 10^5 compared to DC voltages while still leading to easily observable 1/f noise, suggesting the plausibility of very small RTN being responsible for 1/f in other systems even if no obvious RTN has yet been observed. [1] A. van der Ziel, Physica **16**, 359 (1950)

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