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Establishing a Nonequilibrium Fluctuation-Dissipation Theorem Through Simultaneous Measurement of the Power Spectral Density and Transfer Function of Driven Systems ALEXANDER TREVELYAN, ERIC CORWIN, University of Oregon — We explore the response of a model statistical system to strong, non-linear perturbations to its state variables. Specifically, we work with a tunable model of Johnson-Nyquist noise, designed to permit a driving of both the drift and diffusion terms in the associated White Noise Langevin Equation. We achieve a simultaneous measurement of both sides of the Fluctuation Dissipation Theorem (FDT) by driving the circuit with digitally generated white noise and measuring the output. This allows us to calculate a frequency-dependent effective temperature for the driven system, which for an equilibrium system should be set by the energy scale of the input white noise. Comparison of the two sides of FDT–the circuit's transfer function and the power spectral density of the voltage fluctuations–across frequency-space proves non-trivial, and methods are discussed for achieving the most reliable estimate. After comparing the response for a series of functional signals, we find that FDT, measured in this simultaneous fashion, remains intact even while the system is being actively driven out of equilibrium.

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