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Revealing non-Gaussian noise through noise-induced switching in a parametric oscillator PAVEL POLUNIN, Michigan State University, PANPAN ZHOU, Hong Kong University of Science and Technology, NICHOLAS MILLER, SiTime, STEVEN SHAW, Michigan State University, HO BUN CHAN, Hong Kong University of Science and Technology, MARK DYKMAN, Michigan State University — Rates of noise-induced switching between coexisting states of dynamical systems exponentially strongly depend on the noise characteristics. We use the related sensitivity to reveal the deviation of the noise from Gaussian. We study a parametrically driven nonlinear oscillator, which has two stable states of forced vibrations at half the frequency ω_F of the driving field. The states are identical, except that they are shifted in phase by π. Noise causes switching between the states. A stationary noise leads to a stationary distribution over the states. If the noise is Gaussian and coordinate-independent, the probability densities of noise pulses of the opposite polarities are the same. As a result, the state populations are equal. The difference of the state populations is an indication of non-Gaussian noise. We illustrate the effect for a sinusoidal signal at frequency $\omega_F/2$ modulated by Poisson-distributed pulses. We show, theoretically and through the experiment with a micro-electro-mechanical system, that the population difference is highly sensitive to the rate and amplitude of the pulses and displays a characteristic nonmonotonic dependence on the pulse rate. The theory is in quantitative agreement with the experiment.

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