Controlled asymmetric Ising model implemented with parametric micromechanical oscillators

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We show that coupled parametric oscillators provide a well-controlled and fully characterizable physical system for implementation of the asymmetric Ising model, where two coupled spins affect each other differently. Each resonator is parametrically modulated so that there are two coexisting states of vibrations with phase difference of π. The presence of noise induces switching between the two states. When the oscillators are weakly coupled, the rate of interstate switching is changed. The change is asymmetric if the oscillators are not identical. Using two non-identical oscillators weakly coupled to each other, we demonstrate that detail balance is broken. A probability current emerges in the stationary state.

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