

Localized Faraday patterns with inhomogeneous parametric excitation

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Faraday waves are a classic example of a system in which an extended pattern emerges under spatially uniform external forcing. Motivated by systems in which uniform excitation is not plausible, we study both experimentally and theoretically the effect of inhomogeneous forcing on Faraday waves. Our experiments show that vibrations restricted to finite regions lead to the formation of localized subharmonic wave patterns [1] [2], whose localization depends on the extent of the excited region. The prototype model used for the theoretical calculations is the parametrically driven and damped nonlinear Schrödinger equation, which is known to describe well Faraday-instability regimes. For an energy injection with a Gaussian spatial profile, we show that the evolution of the envelope of the wave pattern can be reduced to a Weber-equation eigenvalue problem [3]. Our theoretical results provide very good predictions of our experimental observations provided that the decay length scale of the Gaussian profile is much larger than the pattern wavelength.

Références

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