
Dual subharmonic instability in a soft strip submitted to a parametric forcing

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Abstract

When a system undergoes parametric forcing, it typically responds at half the excitation frequency. This phenomenon known as parametric resonance, was first observed by Faraday in vertically vibrating liquids and then by Melde in his studies of string resonances. In this presentation, we introduce an experiment akin to Melde's but with a significant twist: we use a strip made of a soft material, i.e. with a low Young's modulus. Under longitudinal vibration, this allows spatial modulation alongside temporal modulation, leading to an atypical response distinct from the classic Faraday-type sub-harmonic instability. We observe the creation of pairs of sub-harmonic frequencies (e.g., $f/3$ and $2f/3$, or $f/4$ and $3f/4$, where f is the forcing frequency). By varying f , the unstable pairs are modified. A theoretical model based on multi-scale analysis is used to predict and describe the dynamics of these observations.

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