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Energy Transport in 1-Dimensional Oscillator Arrays With Hysteretic Damping

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Abstract: Energy transport in 1-dimensional oscillator arrays has been extensively studied to date in the conservative case, as well as under weak viscous damping. In particular, when driven at one end by a sinusoidal force, such arrays are known to exhibit the phenomenon of *supratransmission*, or sudden energy surge, above a critical driving amplitude. In this paper, we examine such arrays in the presence of *hysteretic damping*, which occurs when energy loss per cycle is independent of the deformation frequency, and include nonlinear stiffness forces that are important for many materials at relatively high energies. We employ Reid's model of local hysteretic damping and Spitas' model of nearest neighbor dependent hysteretic damping and compare their supratransmission and wave packet spreading properties in the deterministic as well as stochastic case. The results have important quantitative differences, which should be helpful when comparing the merits of the two models in specific engineering applications.

Keywords: Oscillator arrays, hysteretic damping, supratransmission, energy transport