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Experimental Study of Nonlinear Energy Pumping

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Experimental verification of passive nonlinear energy pumping in a system of coupled oscillators with an essentially nonlinear end attachment is carried out. It is shown that passive transfer of energy (energy pumping) from the linear oscillators to the nonlinear attachment can take place. Agreement between simulated and experimental results was observed, in spite of the strongly nonlinear and transient dynamics of the system considered. The experiments bear out earlier predictions that a significant fraction of the energy introduced directly to a linear structure by an external impulsive (broadband) load can be transferred (pumped) to an essentially nonlinear attachment, and dissipated there locally without spreading back to the system. In addition, the reported experimental results confirm that (a) nonlinear energy pumping occurs above a threshold of the input energy, and (b) resonance capture cascades occur where the nonlinear attachment resonates in sequence with a number of linear modes.

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