

**Bifurcations of Damped Nonlinear Normal Modes: Linear Oscillator with Strongly Nonlinear Attachment****Oleg V. Gendelman***Faculty of Mechanical Engineering, Technion, Haifa, Israel*

Linear oscillator coupled to damped strongly nonlinear attachment with small mass is considered as model design for nonlinear energy sink (NES). The coupling and damping terms are adopted to be symmetric and to depend only on relative displacement of the oscillator and the attachment. Damped nonlinear normal modes of the system are considered for the case of 1:1 resonance by combining the invariant manifold approach and multiple scales expansion. Special asymptotical structure of the model allows clear distinction between three time scales. These time scales correspond to fast vibrations, evolution of the system towards the nonlinear normal mode and time evolution of the invariant manifold respectively. Cusp catastrophe scenario is proved to be the only possible for the invariant manifold in time–amplitude–damping coefficient domain. Passage of the invariant manifold through saddle-node bifurcation may bring about destruction of the resonance regime and essential increase of the energy dissipation rate.

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