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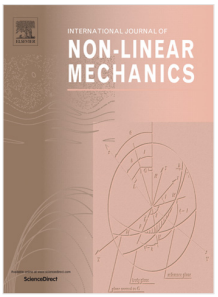

Impact based wideband nonlinear resonating metamaterial chain

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Impact based wideband nonlinear resonating metamaterial chain

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Abstract

Due to the out of phase vibration of the internal units, unusual frequency dependent extreme properties, such as negative effective mass, can be perceived in a metamaterial. However, the performance of the linear metamaterial is limited to a narrow bandwidth due to the dependency on linear resonance. In this paper, this main limitation of the metamaterial is addressed by introducing the piecewise linear impacting oscillator at the mass-in-mass resonating unit. The impacting system dissipates energy and consequently attenuates the vibration of the main structure due to the counteraction of the external excitation by the resulting impulse force. Attenuation bandwidths can be increased in higher and lower frequency side for impact metamaterial as it can attenuate the two transmission peaks. In the lower frequency side attenuation bandwidth can be increased 50% and in the higher frequency side it theoretically becomes infinite. Therefore, impacting metamaterial can be considered as