One dimensional wave dynamics in elastically asymmetric media

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Abstract

A relatively novel class of architected materials based on specifically designed internal contacts is developed.
Because of the unilateral and discontinuous properties of the contact interaction, the resulting materials possess a strong and tunable elastic asymmetry. This asymmetry results in different wave speeds of tensile and compressive components of elastic waves. The faster component can overtake the slower one resulting in their dissipative annihilation through energy cascades. Efficient absorbing assemblies are presented and analysed numerically. The length of the asymmetric part needed to damp a harmonic signal is determined analytically and validated numerically. Transmission properties for random self-affine wave-packets are studied: a universal scaling for the transmission factor variation with the length of the asymmetric part was established.

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