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Nonlinear effects in hyperelastic canonical quasi-crystalline waveguides

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Abstract

This work explores the nonlinear effects of one-dimensional canonical periodic elastic waveguides made of hyperelastic materials. Canonical waveguides were introduced by one of the Author in the field of one-dimensional meta-structures

Keywords:

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References:

[1] by studying classes of quasi-crystalline structuresobtained from the Fibonacci sequence. So far, the study hasbeen limited to linear elasticity. In this contribution, weinvestigate the effects of nonlinearity on the propagationof incremental waves assuming a neo-Hookean material. Inparticular, we demonstrate the change in the canonicalratio as a function of the axial stretch, how to exploitnonlinearities to induce a switch between pass bands andstop bands of the dispersion diagram, and how to induceinterface modes when two semi-infinite

waveguides areconnected at a common interface. The work will shed lighton the suitability of the concept of canonical waveguide inthe nonlinear range.

[1] Gei, M., Chen, Z., Bosi, F. and Morini, L. (2020).Phononic canonical quasicrystalline waveguides. AppliedPhysics Letters 116, 241903.