

Research Highlights

**First systematic comparative analysis of lattice geometries in locally resonant sonic crystal plates:
PWE/EPWE computational framework with finite element validation**

- First comparative analysis of five lattice geometries for metamaterial plates
- Bandwidth mapping across 15 frequencies reveals geometry-dependent performance maps
- Multi-resonator dual bandgaps through in-phase/anti-phase coupling mechanisms
- Triangular lattices: 35% superior bandwidth, 25% kagomé mass, 1800-5700× speedup
- Frequency-dependent design framework for aerospace/automotive vibration control

Keywords: Locally resonant metamaterial, Flexural waves, Band gaps, Lattice configurations, Semi-analytical method, Frequency-dependent optimization, Low-frequency vibration control