Locally-resonant crystals

3D locally-resonant crystal

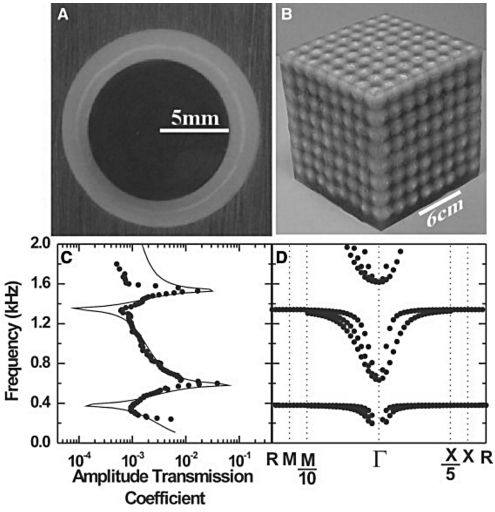

Figure: **Lead spheres coated with rubber, in epoxy matrix.** (a) Coated lead sphere. (b) $8 \times 8 \times 8$ crystal. (c) Calculated (solid line) and measured (circles) amplitude transmission coefficient along the [100] direction. (d) Band structure [32].

Formation of Bragg and locally-resonant band gaps

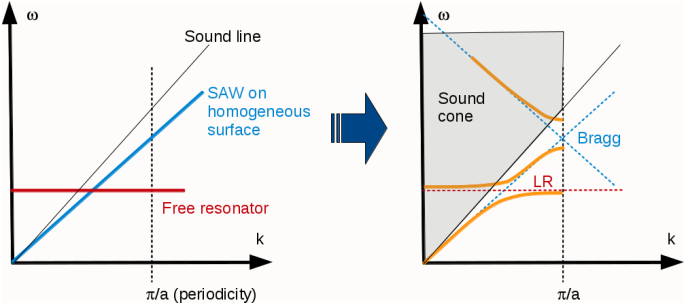

Figure: **Schematic representation of the formation of Bragg band gaps and of locally-resonant band gaps.**

Sub-wavelength Helmholtz resonators along a waveguide

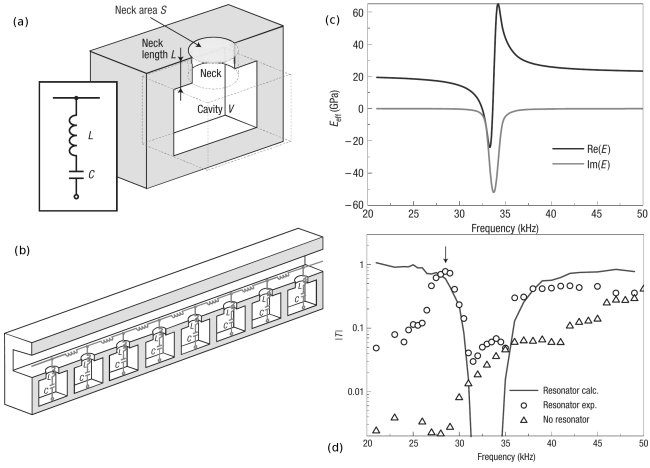

Figure: The sample is made of aluminum filled with water. Dimensions are millimetric [33]).

Periodic array of resonators grafted on a waveguide

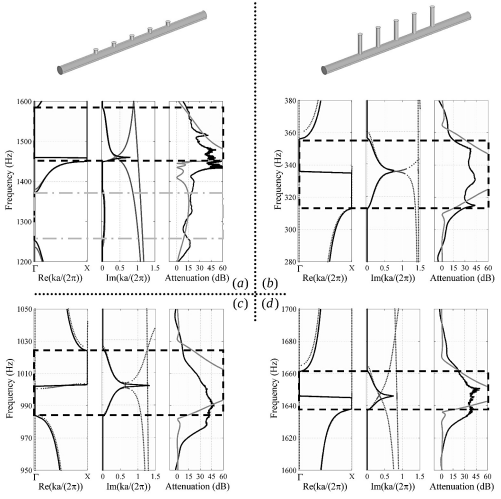

Figure: **Transmission through arrays of 5 resonators grafted on an air tube.** $a = 250$ mm [34].

Periodic array of resonators in air

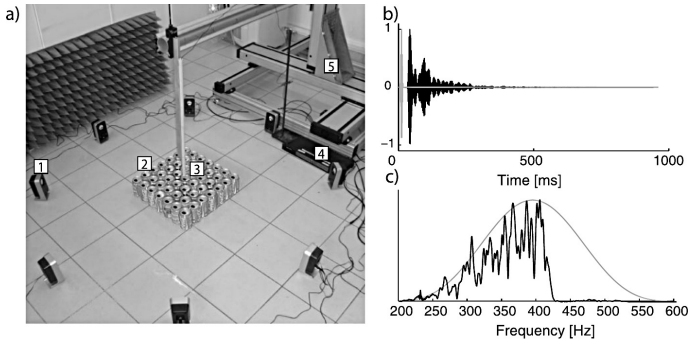

Figure: **A square-lattice periodic array of** 7×7 **soda cans in close-packed position**. (a) The array is surrounded with 8 audio speakers placed in its far-field. A typical recorded sound form (b) and its Fourier transform (c) indicate a pass-band extending below the resonance frequency of the cans, 420 Hz, and a locally-resonant band gap extending above it [35].

Phononic crystal slab of pillars I

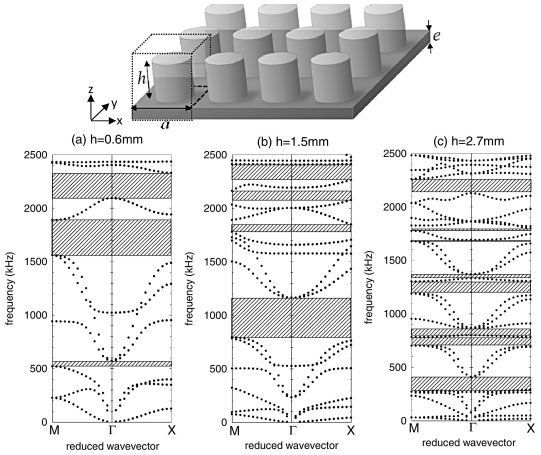

Figure: **Locally-resonant phononic crystal slab of pillars.** (a) $h/a = 0.6$, (b) $h/a = 1.5$, and (c) $h/a = 2.7$. The thickness of the membrane is $e/a = 0.2$ and the filling fraction is 56.4% ($d/a = 0.84$) [36].

Phononic crystal slab of pillars II

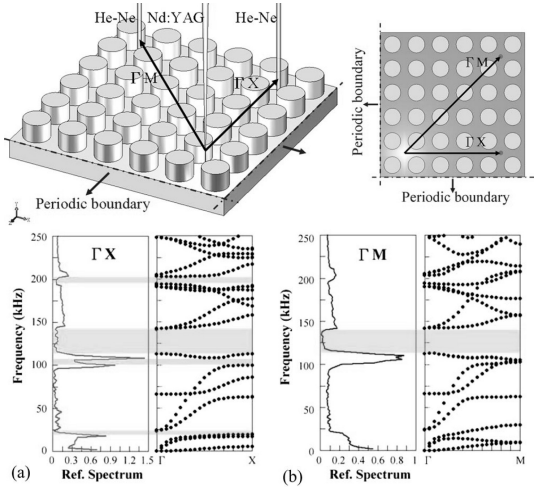

Figure: **Locally-resonant phononic crystal slab of aluminum pillars on an aluminum plate**. height $h/a = 1$. Membrane thickness $e/a = 0.1$. $a = 10$ mm. $d/a = 0.7$. [37].

Surface phononic crystal of pillars I

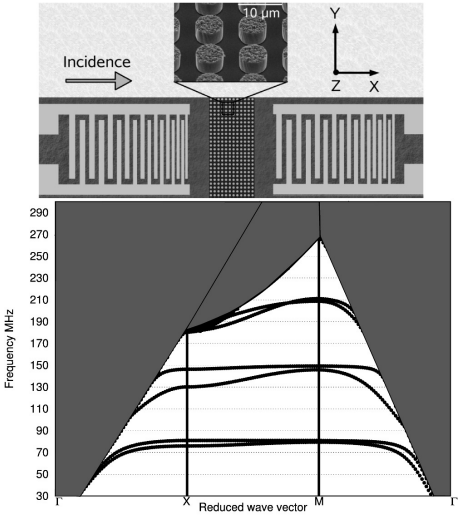

Figure: Nickel pillars have a radius of 3.2 µm and a height of 4.7 µm. They are arranged according to a square lattice with a pitch of 10 µm. Lithium niobate substrate [38].

Surface phononic crystal of pillars II

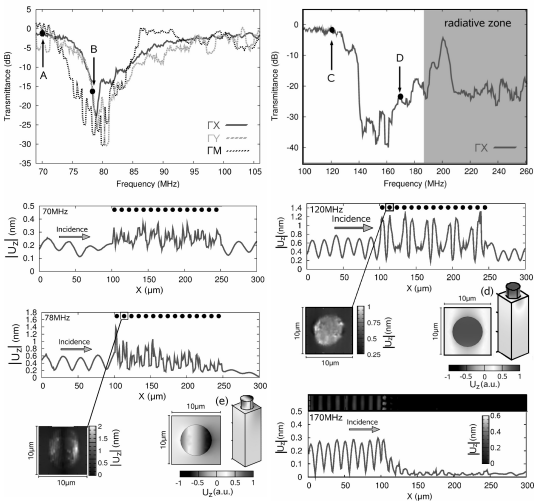

Figure: **Experimental results** [38].

Surface phononic crystal of pillars III

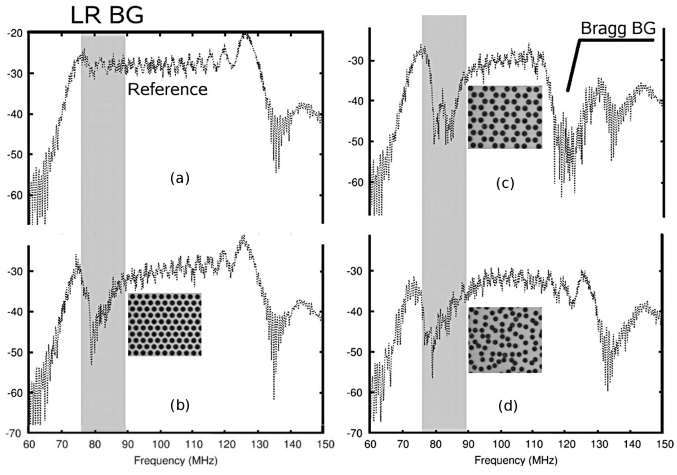

Figure: **Influence of lattice symmetry on local-resonances.** [39].