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# Acoustics I: sound generation

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# mechanisms of sound production

# production of sound

sound is generated by time dependent excitations, such as:

- ▶ abrupt relaxation of compressed air (bursting balloon)
- ▶ abrupt gas production (explosion)
- ▶ modulated air flow (siren)
- ▶ oscillating air column (organ pipe, acoustical laser)
- ▶ vibrating body (loudspeaker membrane, tuning fork)
- ▶ abrupt local heating of air (lightening and thunder)

# acoustical laser

# acoustical laser

standing wave in a  $\lambda/4$  resonator:



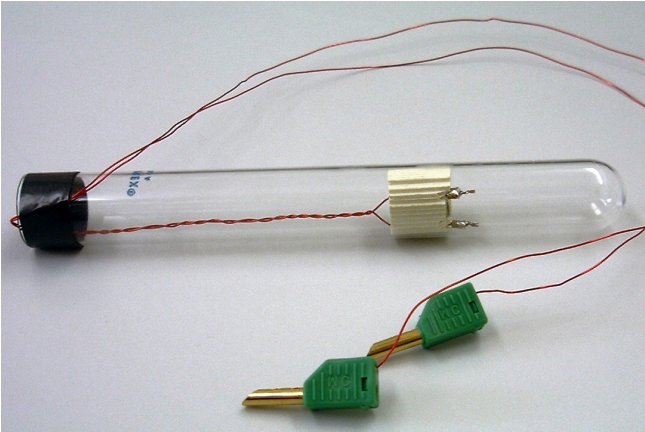
- ▶ back- and forth oscillation of air
  - ▶ temperature field:
    - ▶ movement to the right: compression  $\rightarrow$  increase of temperature
    - ▶ movement to the left: expansion  $\rightarrow$  temperature decrease
  - ▶ generation of a temperature gradient
  - ▶ installation of an external temperature gradient  $\rightarrow$  excitation of the resonance

# acoustical laser

sound production mechanisms

acoustical laser

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Sound Generation

sound production  
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