



Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Acoustics I: sound generation

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acoustical laser

sound generation
mechanisms

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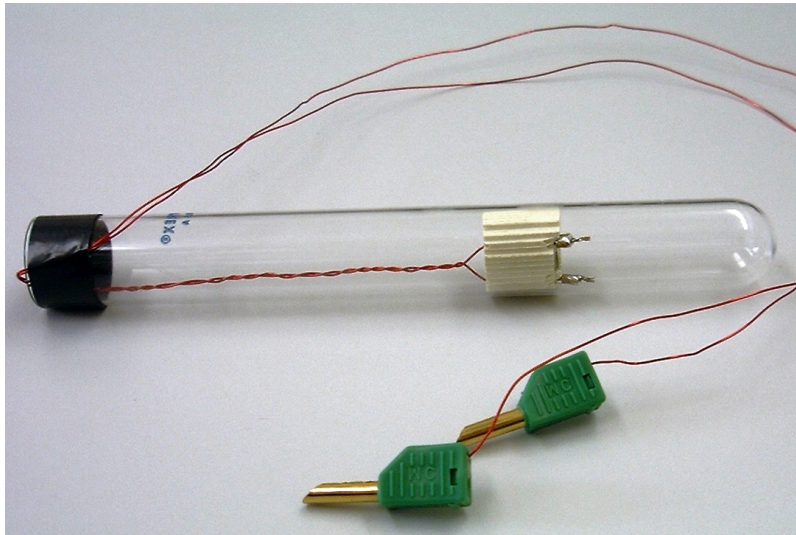
acoustical laser

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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

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mechanisms of sound generation

generation 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)

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