AN ACOUSTIC DEMONSTRATION MODEL FOR CW AND PULSED SPECTROSOCOPY EXPERIMENTS

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High school and undergraduate students have often difficulties if new concepts are introduced in their physics or chemistry lectures. Lecture demonstrations and references to more familiar analogues can be of great help to the students in such situations.
We have developed an experimental setup to demonstrate the principles of cw absorption and pulsed excitation - emission spectroscopies, using acoustical analogues. Our radiation source is a speaker and the detector is a microphone, both controlled by a computer sound card. The acoustical setup is housed in a plexiglas box, which serves as a resonator. It turns out that beer glasses are suitable samples; this also helps to keep the students interested! The instrument is controlled by a LabView program. In a cw experiment, the sound frequency is swept through a certain frequency range and the microphone response is recorded simultaneously as function of frequency. A background signal without sample is recorded, and background subtraction yields the beer glass spectrum. In a pulsed experiment, a short sound pulse is generated and the microphone is used to record the resulting emission signal of the beer glass. A Fourier transformation of the time domain signal gives then the spectrum.
We will discuss the experimental setup and show videos of the experiments.