Mechanics

Acoustics

Sound waves

Acoustic beats - Recording with CASSY

Description from CASSY Lab 2

For loading examples and settings, please use the CASSY Lab 2 help.

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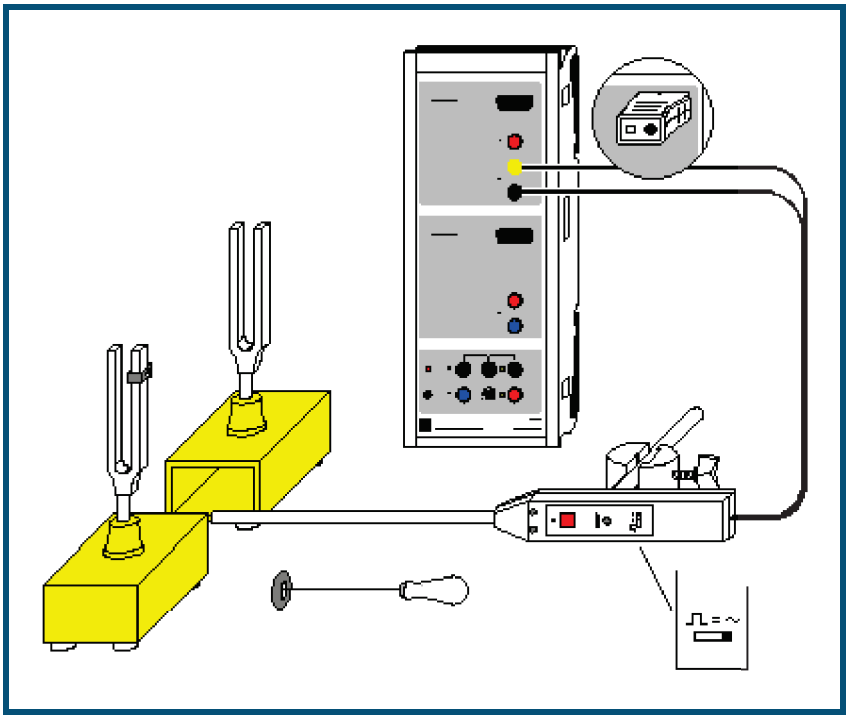
Acoustic beats



can also be carried out with Pocket-CASSY and Micro-CASSY

Experiment description

This experiment records a beat caused by two tuning forks having slightly different frequencies. The individual frequencies f_1 and f_2, the new oscillation frequency f_n and the beat frequency f_s are determined and compared with the theoretical values

$f_n = ½ (f_1 + f_2)$ and $f_s = | f_1 – f_2 |$.

Equipment list

1	Sensor-CASSY	524 010 or 524 013
1	CASSY Lab 2	524 220
1	Multi-purpose microphone with Base or	586 26 300 11
1	Microphone S	524 059
1	Pair of resonance tuning forks	414 72
1	PC with Windows XP/Vista/7	

Experiment setup (see drawing)

Position the two tuning forks and the multipurpose microphone and connect the latter to input A of Sensor-CASSY (don't forget to set the microphone to "Signal" mode and switch it on). "Mistune" one of the tuning forks slightly by attaching an additional weight.

Carrying out the experiment

- Load settings
- Strike the first tuning fork and start the measurement with .
- Optimize the signal strength using the control on the microphone.
- Determine the frequency f_1 (e.g. by marking the **Standard** display with vertical lines or finding the peak center in the **Frequency Spectrum**).
- Delete the measurement with .
- Strike the second tuning fork and start the measurement with .

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- Find frequency f_2.
- Delete the measurement with .
- Strike both tuning forks equally hard and start the measurement with .

Evaluation

When the amplitudes of the two tuning forks are equal, the nodes and antinodes in the beat become clearly distinguished. The beat frequency f_s is determined from the interval T_s between two nodes as $f_s = 1/T_s$.

To ensure satisfactory accuracy in determining the new oscillation period T_n, you should average the measurements over 10 periods before determining the new oscillation frequency as $f_n = 1/T_n$. To determine the time differences you can e.g. insert vertical lines in the diagram or measure the difference directly.

In this example we obtain $f_1 = 425$ Hz, $f_2 = 440$ Hz, $f_n = 433$ Hz, $f_s = 14.5$ Hz, which closely confirms the theory $f_n = ½ (f_1 + f_2) = 432.5$ Hz and $f_s = | f_1 – f_2 | = 15$ Hz.

Click on the **Frequency Spectrum** to read out the two frequencies f_1 and f_2 of the tuning forks and their amplitudes. The easiest way to determine the frequency is to find the peak centers.

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