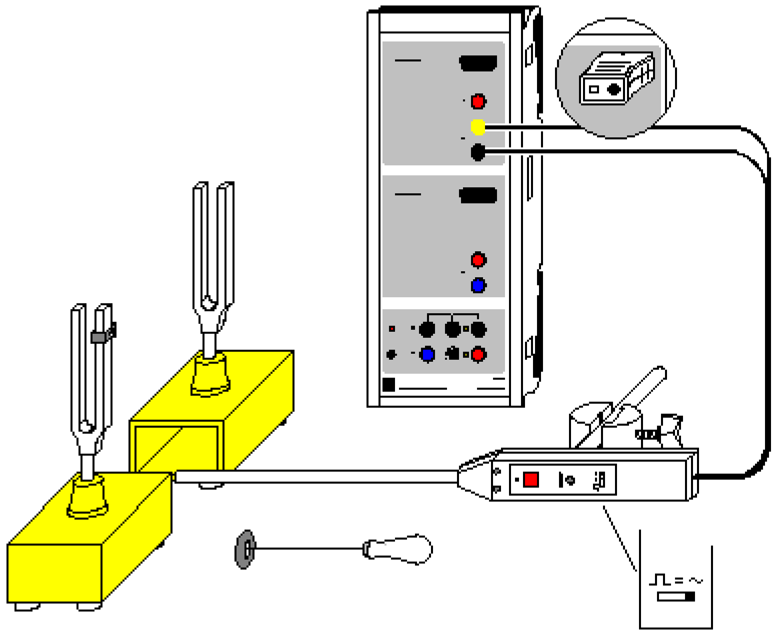
Acoustic beats



can also be carried out with Pocket-CASSY

Load example

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 fs 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
1	CASSY Lab	524 200
1	Pair of resonance tuning forks	414 72
1	Multi-purpose microphone	586 26
	with Base	300 11
	or	
1	Microphone S	524 059
1	PC with Windows 98/2000/XP/Vista	

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 **F9**.
- 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 **F4**.
- Strike the second tuning fork and start the measurement with **F9**.
- Find frequency f_2.
- Delete the measurement with **F4**.
- Strike both tuning forks equally hard and start the measurement with **F9**.

Evaluation

When the amplitudes of the two tuning forks are equal, the nodes and antinodes in the beat become clearly distinguished. The beat frequency fs 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.