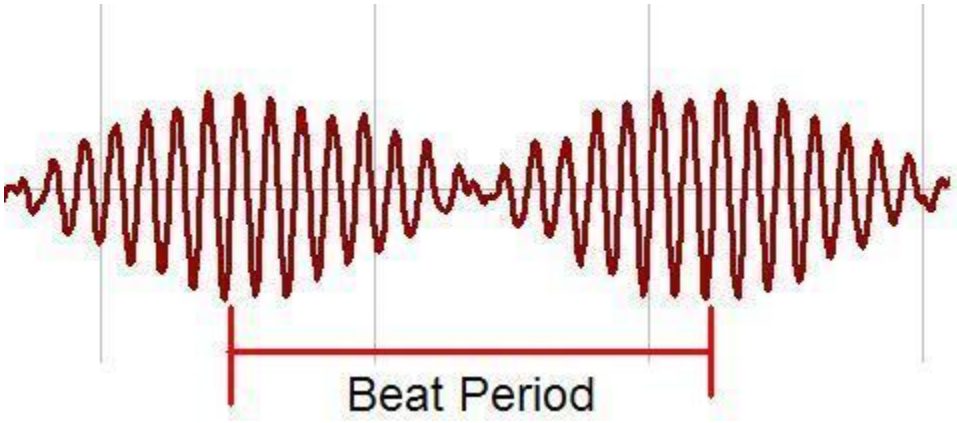
Beats

10.2.1 Explain the formation of beats

Beats are generated when two sounds have similar frequency. The effect is that the sound's amplitude or volume oscillates or beats. The beat phenomenon is caused by constructive and destructive interference. The picture below shows the beat generated by two tuning forks with very close frequencies.



The graph above is amplitude (sound pressure) vs. time. The period of the beat is defined as the time from one peak to the next, or the time between amplitude (volume) maximums.

10.2.2 Derive the beat frequency formula

The simplest way to "derive" the beat frequency formula is by simple observation – okay that sounds a bit cocky. But if you have microphone and a few tuning forks or just a good ear and the ability to count accurately this relation can be demonstrated pretty easy.

The applet below will allow you to "see" and hear beats. The two sliders allow you to adjust the frequency of the tones. The more similar the frequencies the easier the beats are to count accurately. However, a large difference (around 0.5 kHz or 500 Hz) allows you to "see" the difference given the window and scale I choose for the applet. Play around.

By observation (i.e. data gathering) it can be found that the beat frequency is:

(1)

$$f_b = |f_1 - f_2|$$

Source: http://ibphysicsstuff.wikidot.com/beats