

Evaluating the Fidelity of the Speaker

The fidelity of a speaker can be evaluated by using a sound level meter to measure the output of the speaker in response to a series of tones played at different frequencies. A speaker with perfect fidelity would output the same sound level across all frequencies. However, in practice no speaker has perfect fidelity.



Figure 1. Sound level meter.

In one activity, middle school students evaluated the output of speakers that they designed, using a sound level meter to measure the output of the speaker in response to tones with frequencies of 125, 250, 500, 1000, 2000, and 4000 Hz.

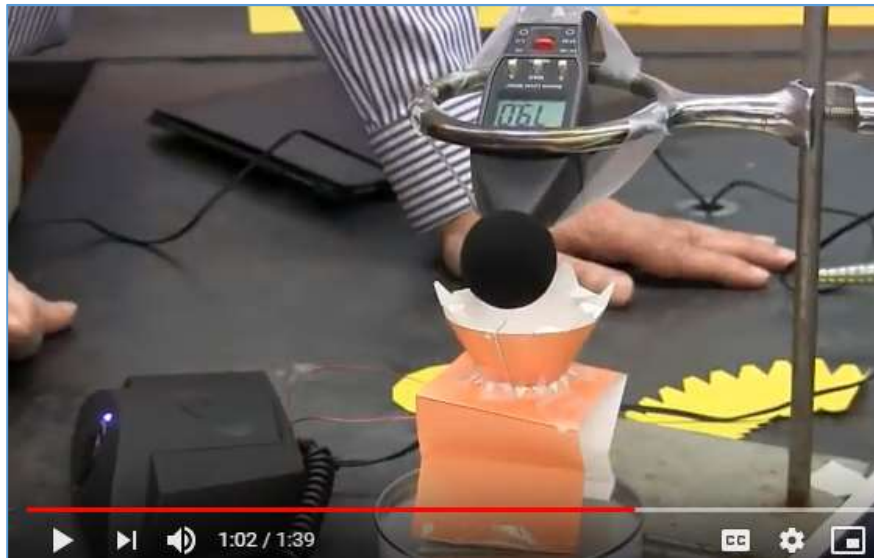


Figure 2. Evaluating the speaker output (<https://youtu.be/AYBOgOcIHPw>).

The data that they collected for two speakers of different sizes was recorded in the table below.

| Table 1. Frequency response of two speakers (measured in decibels). | | | | | | |
|--|-------|-------|-------|-------|-------|-------|
| Frequency (Hz) | 125 | 250 | 500 | 1000 | 2000 | 4000 |
| Speaker 1 | 79 dB | 90 dB | 57 dB | 56 dB | 53 dB | 52 dB |
| Speaker 2 | 67 dB | 70 dB | 72 dB | 77 dB | 94 dB | 75 dB |

The students then graphed the results, shown in Figure 3 below.

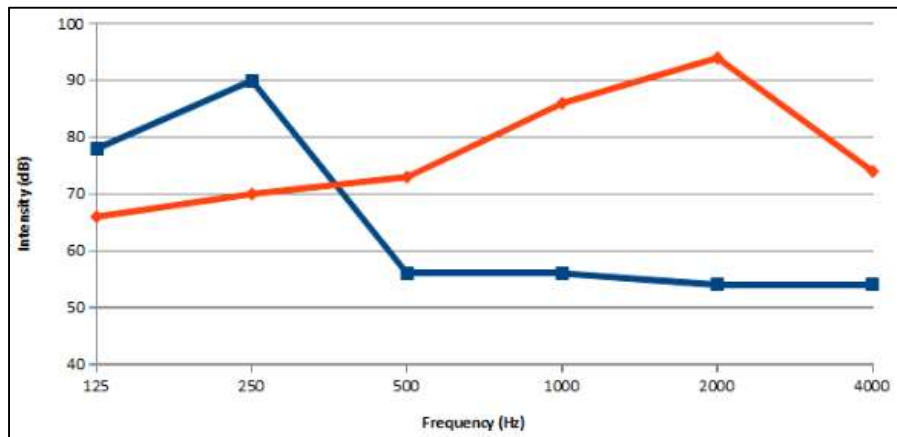


Figure 3. Graph of the frequency response of two speakers.

The frequency response recorded for the speaker with the larger diameter is plotted with a blue line. The frequency response recorded for the speaker with smaller diameter is plotted with a red line. The speaker with the larger cone (which consequently had a higher mass) has a lower resonant frequency that peaks at 250 Hz. The speaker with the smaller cone (and lower mass) had a higher resonant frequency that peaks at 2000 Hz.