

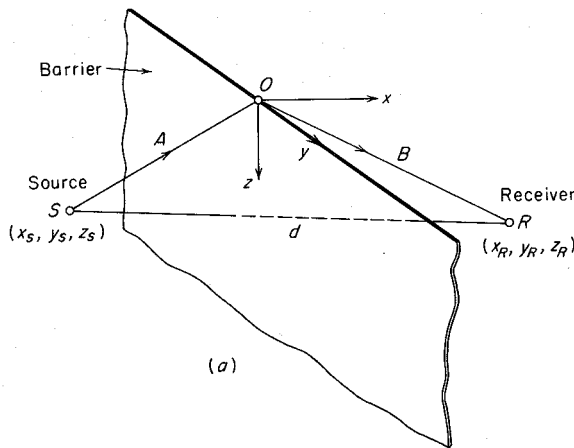
ME 458 Noise Control Laboratory #8

Barriers

Objectives:

1. Experimentally determine the effectiveness of a noise barrier.
2. Compare to theoretical predictions

Background: Sound barriers (i.e. walls) are a common noise control measure, particularly for outdoor noise problems. A simple calculation procedure for the excess attenuation of a long barrier, developed by Z. Maekawa, is:



$$A_{E_{\text{BARRIER}}} = 20 \log \frac{\sqrt{2\pi N}}{\tanh \sqrt{2\pi N}} + 5 \text{ dB} \quad \text{for } N \geq -0.2$$

$$N = \pm \frac{2}{\lambda} (A + B - d) \quad (\text{Fresnel Number})$$

where + sign indicates receiver in the shadow zone
- sign indicates receiver in the "bright" zone

The objective of this experiment is to gather empirical data to verify (hopefully) this relationship. The basic equation to quantify propagation in a free-field is:

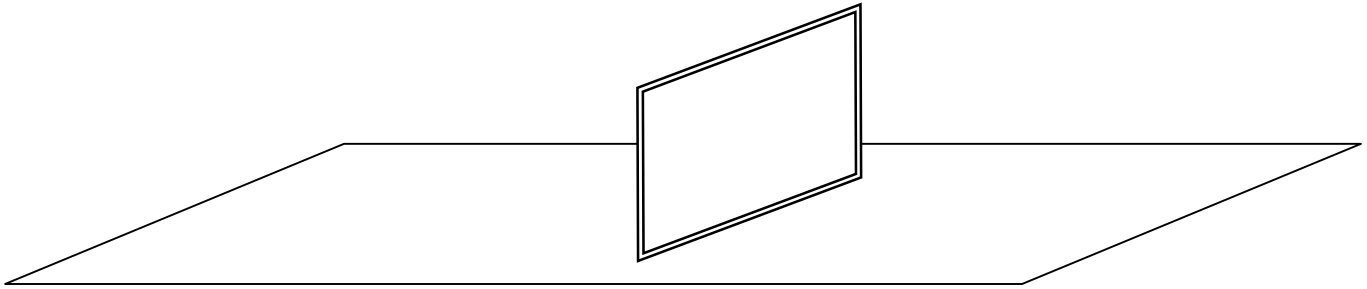
$$L_p = L_w - 20 \log r - 10.83 - A_E$$

A_E = Excess attenuation due to all effects including ground reflection, barriers, atmospheric absorption, etc

Procedure:

1. Use the large speaker, power amplifier and random noise generator to provide a repeatable noise source. Quantify the sound power of the source in each octave band by measurements close to the source without the barrier in place. Measure the sound levels with a sound level meter.
2. Place the barrier (two 4'x8' plywood sheets) approximately in the center of the anechoic room (or outside if the weather is warm enough). Measure the sound levels on the other side of the barrier from the sound source.
3. Calculate the excess attenuation due to the barrier

Test Geometry: (sketch here)



Instrumentation Diagram: (block diagram showing all electrical connections)

Report: Document your procedure and results in a brief, concise lab report. Comment on any differences between theoretical and measured performance. How did you account for the fact that this barrier has three edges while the formula is for an infinitely long barrier (one edge)?