Construction and Initial Measurements of an Acoustic Reflectometer

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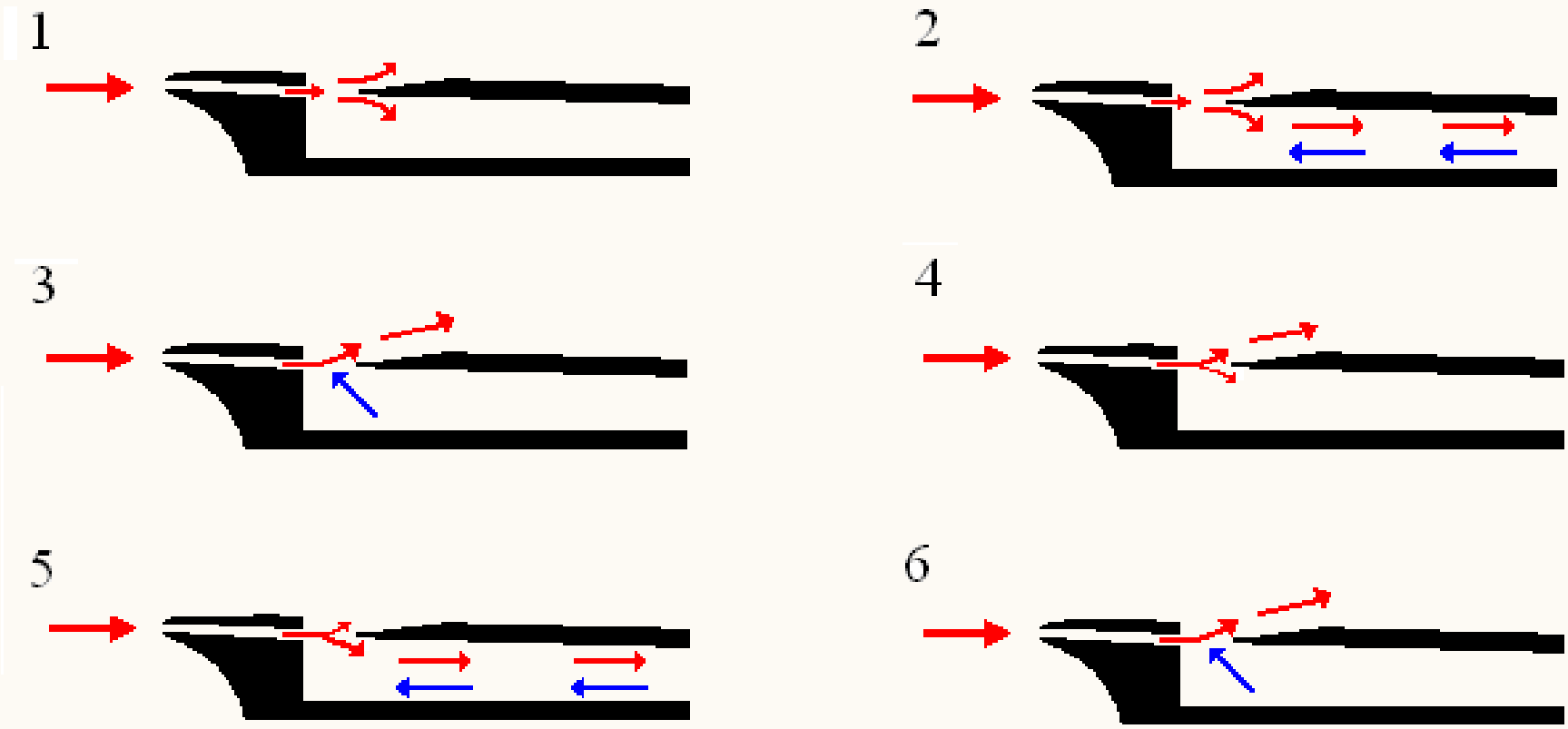
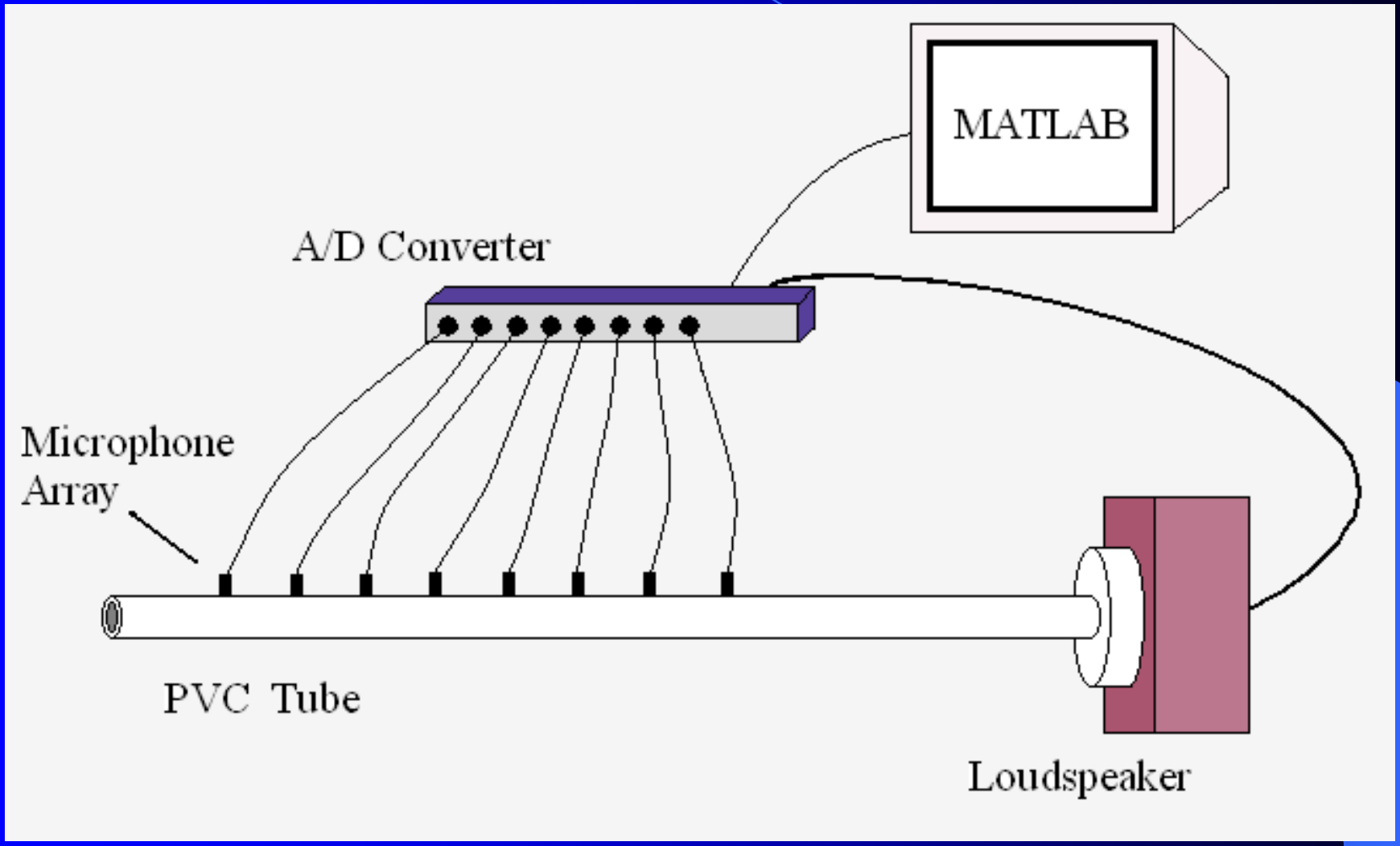
Outline

- How the Air Jet Creates a Tone
- The Acoustic Reflectometer
- Determining Reflectance
- The Reflectance of Several Materials
- Reflectance of a Recorder Mouthpiece
- Polar Plot of Air Jet Reflectance at 800 Hz
- Future Work

How the Air Jet Creates a Tone

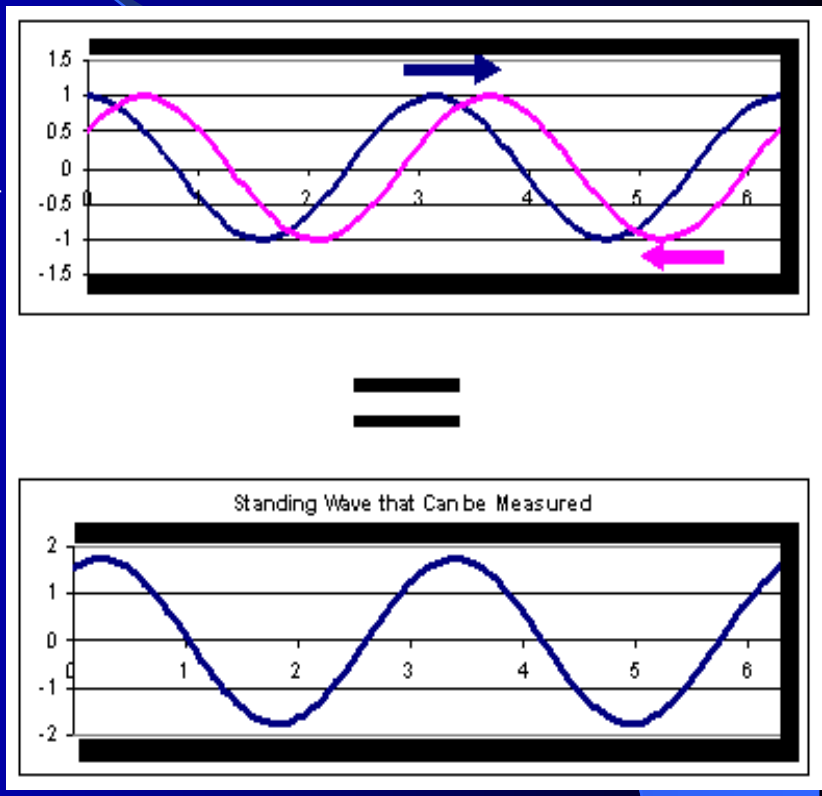


The Acoustic Reflectometer



Determining Reflectance

- The wave measured in the tube is the sum of the incident and reflected wave
- The incident and reflected waves can be determined from the standing wave



Determining Reflectance

- The standing wave can be written as

A Cos(wt-kx) + B Cos(wt+kx + phi)

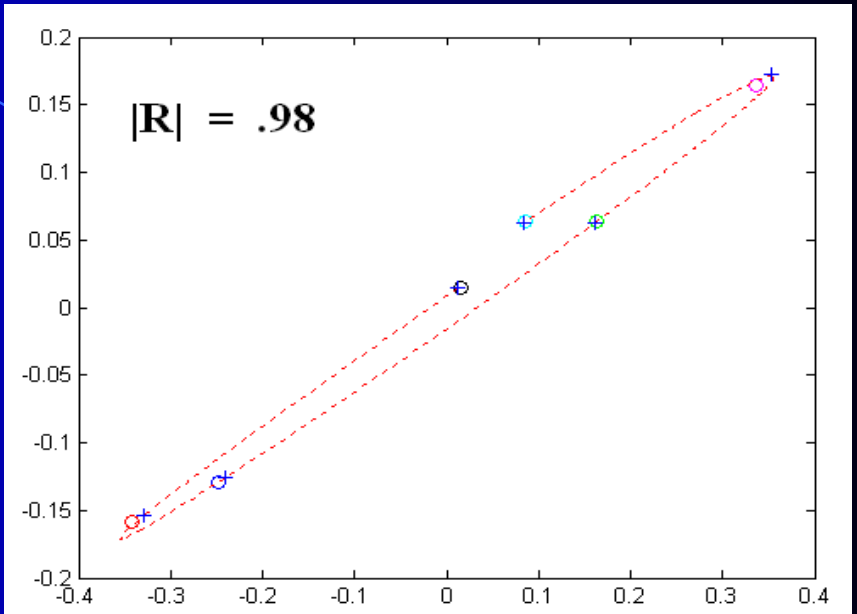
or in a more useful form

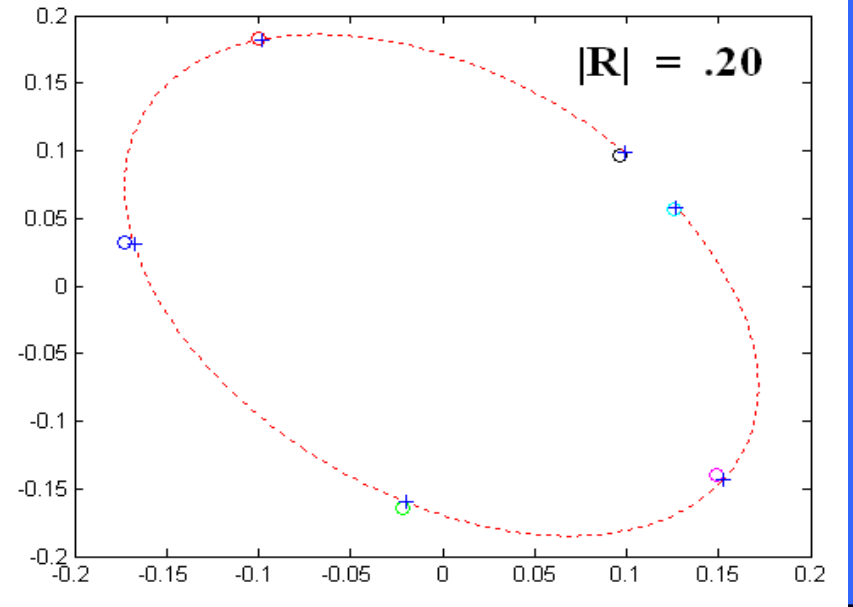
Re[A*exp(i*(wt - kx))] + Re [B*exp(i*(wt + kx + phi))]

This complex form of the wave can then be plotted on a polar plot to determine reflectance

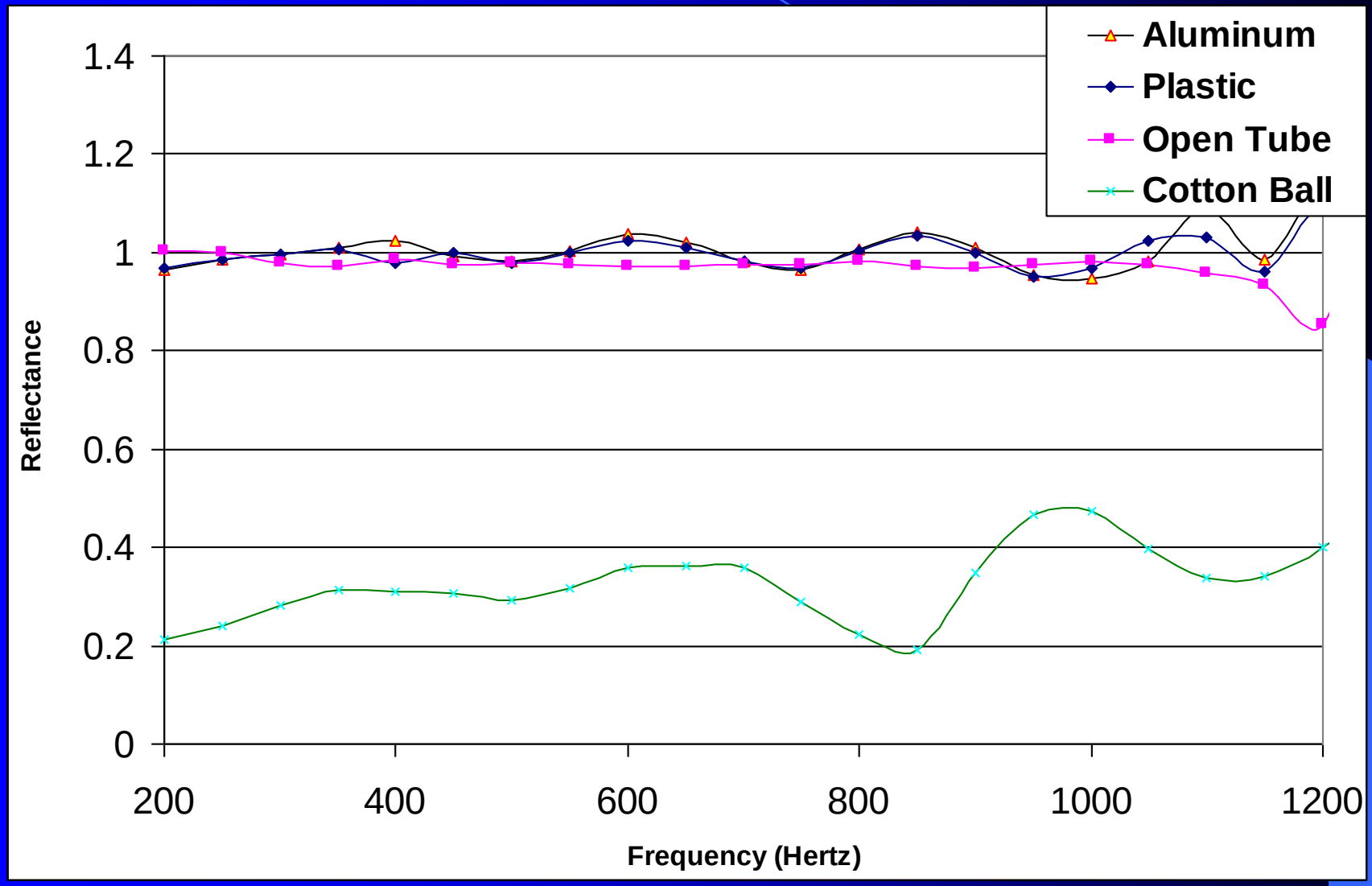
Determining Reflectance

- Plotting the standing wave pattern in the complex plane allows us to determine the incident and reflected waves, which also gives us the reflection coefficient

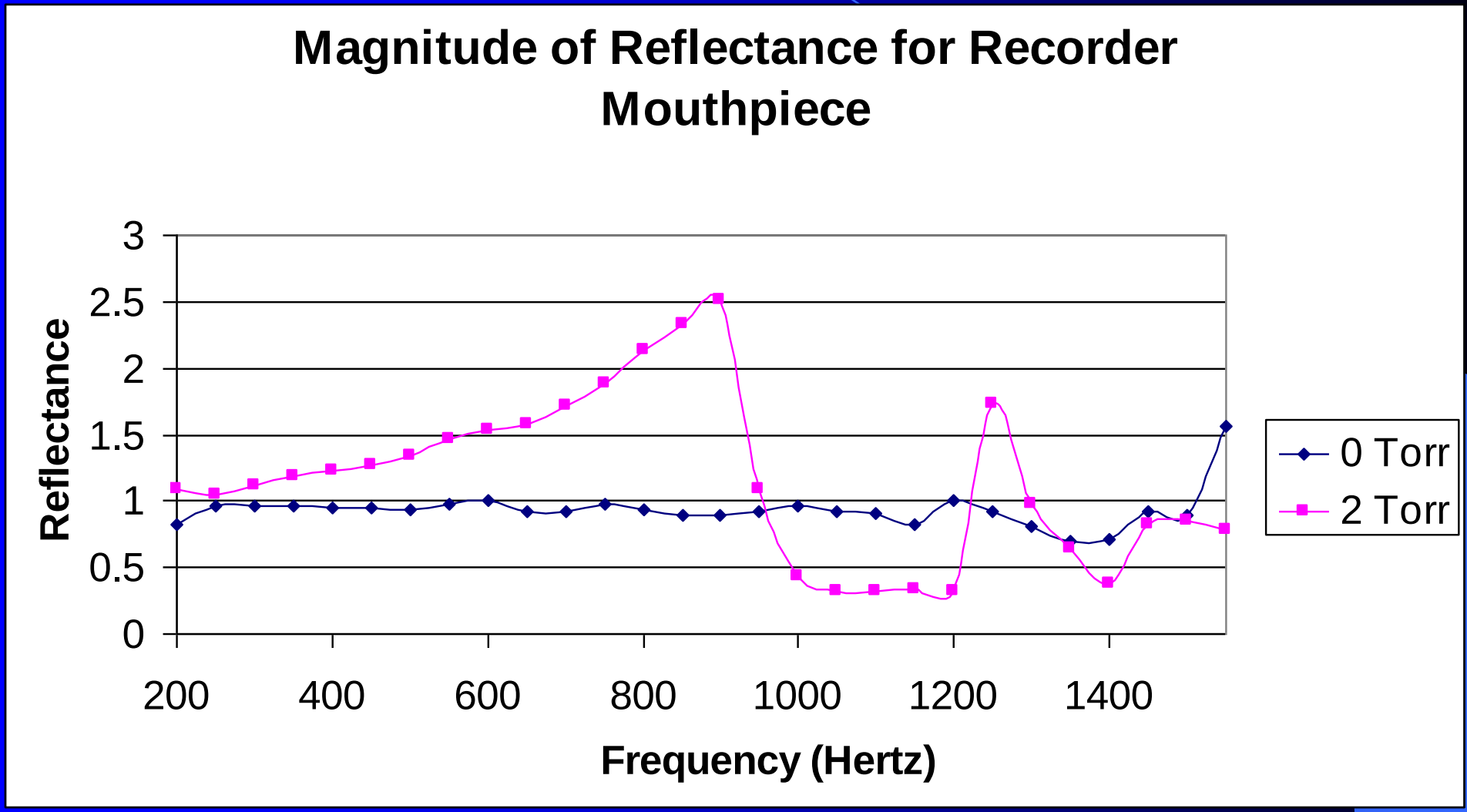




The Reflectance of Several Materials



Reflectance of a Recorder Mouthpiece



Polar Plot of Air Jet Reflectance at 800 Hertz