

LABORATORY

PHYSICS OF SOUND WAVES

OBJECTIVES



THEORY

When a wave is reflected back and forth in a tube, it can form a standing wave. The standing wave is formed by the superposition of two waves traveling in opposite directions. The standing wave has nodes (points of zero displacement) and antinodes (points of maximum displacement). The distance between two adjacent nodes is $\frac{\lambda}{2}$, and the distance between two adjacent antinodes is $\frac{\lambda}{2}$. The distance between a node and an adjacent antinode is $\frac{\lambda}{4}$.

The standing wave in a tube can be formed in two ways: (1) a tube with both ends closed, and (2) a tube with one end closed and the other end open. In the first case, the standing wave has nodes at both ends, and the length of the tube is an integer multiple of $\frac{\lambda}{2}$. In the second case, the standing wave has an antinode at the open end and a node at the closed end, and the length of the tube is an odd multiple of $\frac{\lambda}{4}$.

The standing wave in a tube can be used to determine the wavelength of the sound wave. By measuring the length of the tube and the number of nodes or antinodes, the wavelength can be determined. The speed of sound can then be determined by measuring the frequency of the sound wave and the wavelength.