

Interference of Waves

What happens when two waves are present at the same place?

Always add amplitudes (pressures or electric fields).

However, we observe intensity (power).

For equal A and ω :

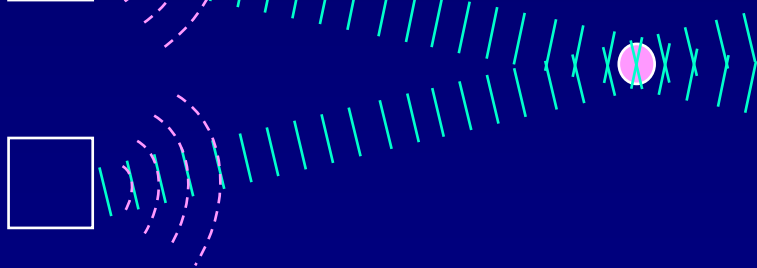
$$A = 2A_1 \cos(\phi/2) \Rightarrow I = 4I_1 \cos^2(\phi/2)$$

Example:

Stereo speakers:



Listener:



Terminology:

Constructive interference:

waves are “in phase”
($\phi = 0, 2\pi, 4\pi, \dots$)

Destructive interference:

waves are “out of phase”
($\phi = \pi, 3\pi, 5\pi, \dots$)

Of course, ϕ can take on an infinite number of values. We won't use terms like “mostly constructive” or “slightly destructive”.