

Amplitude and Intensity

Intensity: How *bright* is the light? How *loud* is the sound?

Intensity tells us the **energy** carried by the wave.

Intensity is proportional to the square of the amplitude.

	Amplitude, A	Intensity, I
Sound wave:	peak differential pressure, p_0	power transmitted/area (loudness)
EM wave:	peak electric field, E_0	power transmitted/area (brightness)

For harmonic waves, the intensity is always proportional to the **time-average** of the power. The wave oscillates, but the intensity does not.

Example, EM wave:
$$I = \frac{\langle E^2 \rangle}{\mu_0 c} = \frac{1}{\mu_0 c} \frac{1}{2} E_0^2$$

For a harmonic wave, the time average, denoted by the $\langle \rangle$, gives a factor of 1/2.

We will usually calculate **ratios of intensities**. The constants cancel.

In this course, we will ignore them and simply write:

$$I = A^2 \quad \text{or} \quad A = \sqrt{I}$$