Department of Defense DoDSTEM
Science · Technology · Engineering · Mathematics

Beam Me Up:
Harnessing Light for Tomorrow's Lasers

Albuquerque, NM (Kirtland Air Force Base)—Scientists describe how to harness the power of light to create laser applications for commerce, the military, or medicine. The key to the laser's power is the coherence and concentration of a single wavelength of light. Current research and development efforts include making lasers more powerful and portable.

"Lasers are all around us. A laser beam is a very coherent, concentrated beam of light." **Alfie Philipe, biologist**

Framework

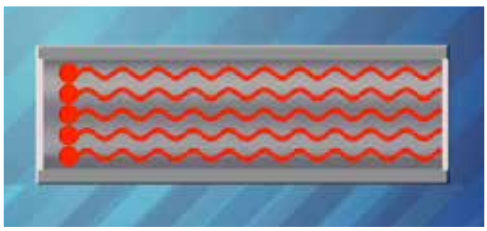
Middle School

Standards

- NSES - B.iii.1 ➤ Energy is associated with light.
- NSES - B.iii.3 ➤ Light interacts with matter.
- STL - 2.P ➤ Technological systems can be connected.
- STL - 3.E ➤ A product or system developed for one setting may be applied to another.

Content Illustrated

- Photons in a laser align in parallel.



Content

Physical Science

- Unlike normal visible light which spreads out in many directions (and may have wavelengths of 400-700 nanometers), lasers concentrate light of a single wavelength into parallel paths.
- During laser production, energy (electrical or chemical) is added to atoms, which excites electrons. As the electrons decrease their energy levels, they emit photons of a particular wavelength.
- Photos in the laser tube bounce back and forth between mirrors, causing the photons to line up and the light to amplify. One of the mirrors in the tube is partially transparent, allowing a small percentage (about 15%) of the light to pass through and out as a beam.

Technology

- Lasers are used in everyday life as grocery store scanners, printers, surgical tools, and digital media readers, among other ways.
- Fiber optic cables are used for telecommunications and military applications.

Engineering

- The cutting edge of laser technology is portability using fiber optic cables bundled and attached to a lens. When the beam is carried on a cable, it can go around corners or over walls.

Guiding Questions

To think about as you watch:

- What materials are used to create laser beams?
- Where can we find lasers used in ordinary technologies in everyday life?

Suggested Activities

- Start and motivate a lesson on light and how the science of light is applied in the real world.
- Identify what's different about lasers that produce various colors of light.

Keywords

chemical laser
coherence
electron
electricity
fiber optics
laser
lens
parallel
photon
wavelength

- *Beam Me Up* can be found online at www.DoDSTEM.us/media/labtv. Visit www.DoDSTEM.us for more LabTV webisodes.