



LASERS

Get the Point

Lasers have many uses in the world around us. You probably know about laser pointers (perhaps you have a cat that chases one!) but you may not know about lasers, like the ones in your DVD player.

Light from a laser behaves differently than light from the sun or from a flashlight. One big difference is that light from a laser is typically **collimated**, meaning that it spreads (or **diverges**) very slowly compared to the light from a flashlight. We take advantage of the ability of lasers to stay in tight beams whenever we use laser pointers and laser level guides.

The “anti-spreading” property of lasers arises because laser beams are **spatially coherent** which means that photons of the beam together act as waves with constant waves over the cross-section of the beam. Scientists often describe the way lasers propagate through space using the theory of **Gaussian beams**.

Another related property of lasers is their ability to be **focused** very tightly into really small spots. The power density in focused laser spots can be enormous, which allows lasers to be used in surgery to make small, precise cuts and in machining to weld or cut dense materials.

The small focused spots also make lasers very useful for reading and writing information from CDs and DVDs. Data on these disks are saved as a pattern of tiny pits. A laser beam can be scanned across the pattern to read out the data. The reflection from the disk will be **deflected** or **diverged**, which reduces the reflected signal and thus delivering the information needed to produce the right sounds and images. The focused laser spot needs to be about the same size as the pit, which means that smaller laser spots allow for smaller pits and higher data densities. Lasers with shorter **wavelengths** generally can be focused to smaller spots. The progression from CDs to DVDs—and now to Blu-Ray disks—has been related to advances in laser technology; CDs and DVDs use red lasers (780 nm and 650 nm wavelength, respectively) and Blu-Ray disks use blue-violet lasers at 405nm wavelength.

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