

LASER: Light Amplification by Stimulated Emission of Radiation  
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A laser is a device that emits light through a process called stimulated emission. Laser light is usually spatially coherent, which means that the light either is emitted in a narrow, low-divergence beam, or can be converted into one with the help of optical components such as lenses. A laser consists of a gain medium inside a highly reflective optical cavity, as well as a means to supply energy to the gain medium. The gain medium is a material with properties that allow it to amplify light by stimulated emission. In its simplest form, a cavity consists of two mirrors arranged such that light bounces back and forth, each time passing through the gain medium. Typically one of the two mirrors is partially transparent, and the output laser beam is emitted through this mirror.

In 1917 Albert Einstein, in his paper *On the Quantum Theory of Radiation*, laid the foundation for the invention of the laser and its predecessor, the maser, in a groundbreaking rederivation of Max Planck's law of radiation based on the concepts of probability coefficients for the absorption, spontaneous emission, and stimulated emission of electromagnetic radiation. In 1947, Willis E. Lamb and R. C. Retherford found apparent stimulated emission in hydrogen spectra and made the first demonstration of stimulated emission. In 1950, Alfred Kastler proposed the method of optical pumping, which was experimentally confirmed by Brossel, Kastler and Winter two years later. The first working laser was demonstrated on 16 May 1960 by Theodore Maiman at Hughes Research Laboratories.

Lasers have a very large number of applications, ranging from medicine, to heavy industry, to entertainment. In medicine, lasers are used in various types of

cosmetic surgery, dentistry, ocular restoration, and even the removal of tumors. Various types of lasers are used in commercial and industrial applications. Laser welding, laser cutting, barcode readers, and laser range finders are just a few types of lasers used. The most common application of lasers in the entertainment industry is the CDs, DVDs, and the various machines that read them, but another popular application is the laser pointer.

Lasers can range in power from the harmless  $>1\text{mW}$  laser pointer, to the  $1.3\text{PW}$  (PetaWatt,  $1 \times 10^{15}$ ) laser located at the Lawrence Livermore Laboratory in California. An interesting application of lasers is to use them to ignite and/or drive a nuclear fusion reaction. In September 2007, the BBC News reported that there was speculation about the possibility of using positronium annihilation to drive a very powerful gamma ray laser. Dr. David Cassidy of the University of California, Riverside proposed that a single such laser could be used to ignite a nuclear fusion reaction, replacing the hundreds of lasers used in typical inertial confinement fusion experiments.

Works Cited:

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