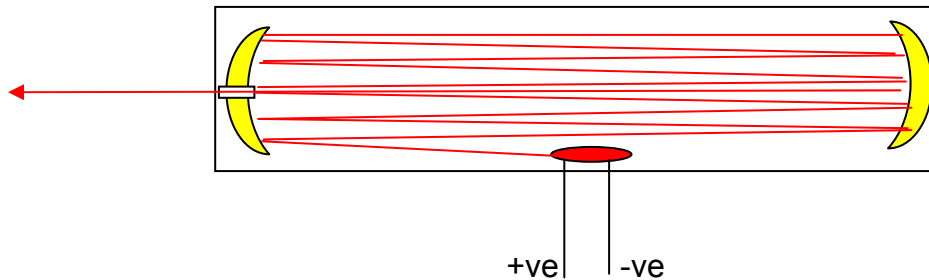


## 1. What is a Tuneable Diode Laser?

Laser is an acronym for :

Light **A**mplification by **S**timulated **E**mission of **R**adiation



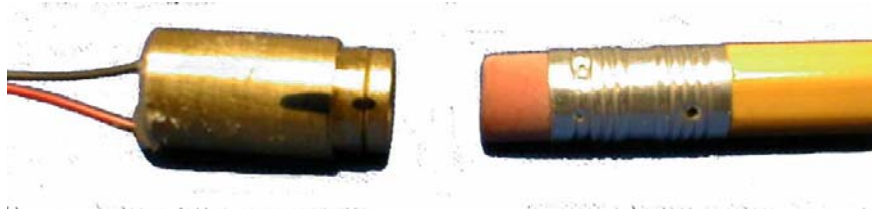
Albert Einstein was first responsible for proposing the idea of the laser in about 1916. Einstein reasoned that if a photon collided with an atom in an excited, high energy state, the atom would emit a photon that was a twin of the first. If enough atoms were to be excited, the chance of photons hitting them would be increased. That would lead to a chain reaction where photons would hit atoms and make new photons, and the process would continue until the original energy source was terminated. Einstein named this phenomenon *stimulated emission of radiation*.

In principle, the laser is a tube with a mirror at each end. In the tube is a crystal which is induced to emit radiation by stimulating it with electricity. The radiation in the tube bounces between the two mirrors and starts a chain reaction. The chain reaction, or *light amplification*, would cause the device to burn up if continued indefinitely. For this reason, a small amount of the reflective coating on one mirror is removed or a small hole placed in it. This causes a small stream of identical photons to be released through the partial coating or hole. The emitted stream of photons is identical in both time and space. This is the 'coherent' radiation characteristic of a laser. A crystal is selected which will emit radiation at a specific wavelength. A ruby crystal emits a visible red beam with a wavelength of 6500 angstroms or 650 nano meters.



## 1. Tuneable Diode Laser ....(continued)

A diode laser works on the same principle except that the tube, mirrors and crystal are all combined in a small package using semiconductor technology. The diode laser is composed of a pn junction, as in the light emitting diode (LED), and specially cleaved mirror facets that form the optical cavity. The output wavelength is fixed. The size of the laser and focussing optics is similar to the eraser on the end of a pencil.



A **tuneable diode laser** can have its wavelength altered very slightly while it is operating. This can be done by changing the operating temperature, or the drive current.