1. 1310 nm Laser source for the Continuous Wave.

INTRODUCTUION:

A laser diode is a semiconductor device that produces high-intensity coherent light. LASER is an abbreviation for Light Amplification by Stimulated Emission of Radiation. The operation of this diode is based on stimulated emission.The P-N junction of a laser diodes are similar to that of an LED; but, unlike LEDs, the P-N junction of a laser diode emits coherent radiation.

Absorption of Energy: The laser diodes are made up of a p-n junction that contains both holes and electrons. (A hole indicates the lack of an electron under this context.) When a voltage is applied to the p-n junction, electrons gain energy and move to a higher energy level.Holes are formed in the excited electron's original position.

Spontaneous Emission: Excited electrons recombine with holes during their upper-state lifespan. The disparity in energy is converted into photons or electric radiation when electrons fall from a higher energy level to a lower energy level.LEDs use the same method to generate light. The disparity between the two energy ratios gives the energy of the released photon.

Stimulated Emission : We need more coherent photons from the laser diodes than those generated by spontaneous emission. A partially reflecting mirror is used on either side of the diode to capture photons emitted from spontaneous emission in the p-n junction before their concentration exceeds a threshold value.These trapped photons stimulate excited electrons to recombine with holes well before their recombination period. This causes the release of more photons that are in exact phase with the original photons, amplifying the output.When the photon concentration exceeds a certain threshold, they escape from the partially reflecting mirrors, producing vivid monochromatic coherent light

EQUIPMENT:

- FOL-DUAL module
- Optical Patch cords

WORKING PRINCIPLE:

The semiconductor junction laser is also called an injection laser because its pumping method is electron-hole injection in a p-n junction. The semiconductor that has been extensively used for junction is the Gallium Arsenide. The features of semiconductor lasers are

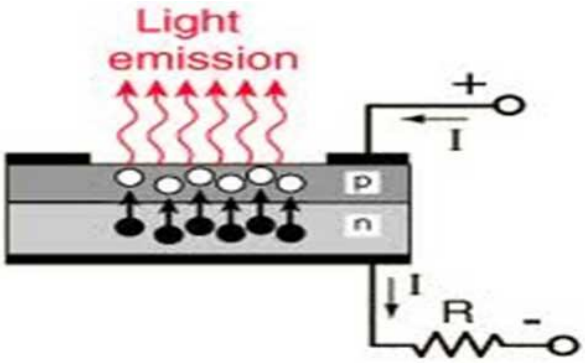
- Extreme mono chromaticity
- High directionality

Three basic transition process related to operation of Lasers are

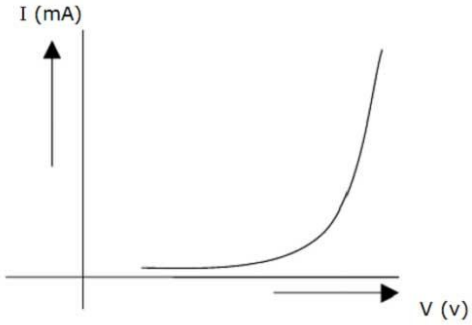
- Absorption
- Spontaneous emission
- Stimulated emission

The starting material is an n-type GaAS doped with silicon in the range of 2-4×10 18 cm -3.A p-type is grown on the wafer by the liquid-phase epitaxial process. The wafer is lapped to a thickness of 75 μm and surfaces are metalized. The wafer is then cleaved into slivers. The next step is to evaporate are flective coating onto one of the cleared facts of the silver so that the laser can emit from only one facet.

Working Principle Diagram:



Model Graph



2. THE SPLICING OF OPTICAL FIBER

INTRODUCTION: Splicing of optical fibers is a **technique used to join two optical fibers**. This technique is used in optical fiber communication, in order to form long optical links for better as well as long-distance optical signal transmission. **Splicers are basically couplers** that form a connection between two fibers or fiber bundles.

At the time of splicing two optical fibers, the geometry of the fibers, their proper alignment and mechanical strength must be taken into consideration.

Working principle

Fusion Splicing

This technique of splicing gives the permanent connection between the two optical fiber cables and gives a longer life with less attenuation. The two cores of fiber cables are joined or fused electrically or thermally. That means an electric device or an electrical arc is used to fuse the two fiber optic cables and produces a connection between them. This technique is very costly and works for a longer period.

Mechanical Splicing

This technique doesn't require a fusion splicer to join the optical fiber together. It uses index matching fluid to hold and align the single or more fiber cables assembled in a place to join them together. The mechanical splicing acts as a junction to join the optical cables more precisely.

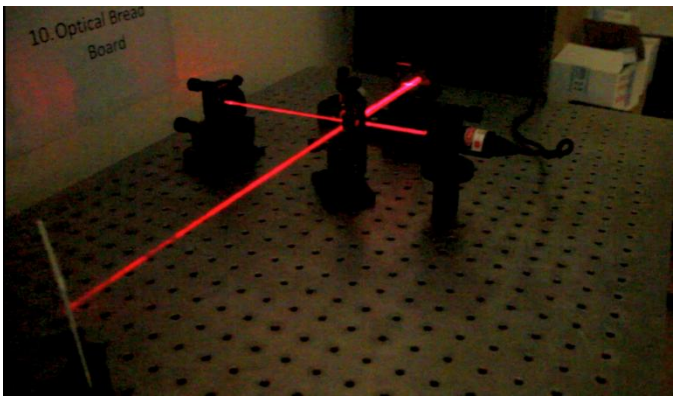
SMF cleaver

Optical fiber splicer

When the optical fiber cables are joined together to pass the light from one to another, the loss of light will be low if we use the mechanical splicing technique. That means insertion loss, splicing loss will be nearly 0.3dB. But it produces high back reflection when compared to fusion splicing. It is very easy to repair and install for both multimode and single-mode optical fiber cable

3. Wavelength measurement using Michelson interferometer

In the Michelson interferometer, coherent beams are obtained by splitting a beam of light that originates from a single source with a partially reflecting mirror called a beam splitter. The resulting reflected and transmitted waves are then re-directed by ordinary mirrors to a screen where they superimpose to create fringes. This is known as interference by division of amplitude.



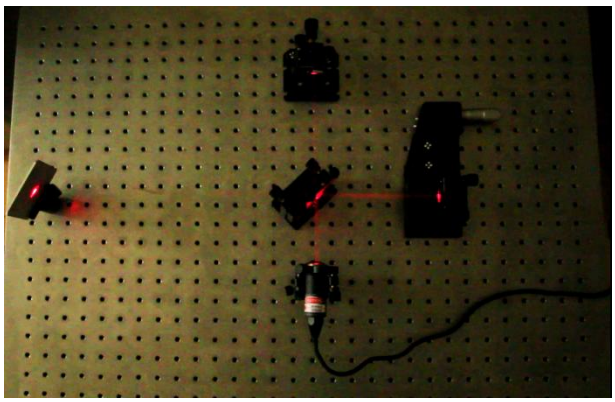
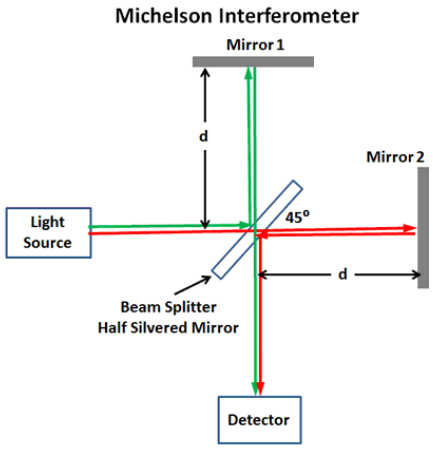


Fig: Optical Bread Board



The wavelength is calculated using,

$$\lambda = (2d/N)\Delta nm$$