



“LASER”

Light Amplification
by
Stimulated Emission
of
Radiation

Principle of LASER



- ▣ A laser is a device that emits light through a **process** of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for **“light amplification by stimulated emission of radiation”**.
- ▣ In easy words we can say that, “a laser is a device that is used to increase the intensity of a single colour source of light in a unidirectional way.”



Interesting Facts

- ❑ The word “laser” started as an acronym for “light amplification by stimulated emission of radiation.”
- ❑ Before laser was developed, there was the “maser.” This stood for “microwave amplification by stimulated emission of radiation” and was based on Albert Einstein’s principle of stimulated emission masers which were used in atomic clocks.
- ❑ Lasers are grouped into specific classes, 1-5, for levels of danger. If you reach level 5, you could suffer permanent blindness and burning skin.

LASERs in Entertainment



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

- ❑ Laser light is used in Laser Shows.
- ❑ The coherent nature of laser light allows a narrow beam to be produced, which allows the use of optical scanning to draw patterns or images on walls, ceilings or other surfaces including theatrical smoke and fog.
- ❑ There is no need to refocus for the differences in distance (as required in video projection).
- ❑ This inherently more focused beam is also extremely visible, and is often used as an effect.
- ❑ Sometimes the beams are "bounced" to different positions with mirrors to create laser sculptures.



**A special
show was
designed &
Presented at
550th Birth
Anniversary
Celebrations
of Guru
Nanak dev ji**



**Enjoy special
LASER Shows
at PGSC**

Popular Graphic shows

- Judwa
- Jai Ho
- Thirsty Crow
- Jungle Boogie

**A special
show was
designed &
Presented at
550th Birth
Anniversary
Celebrations
of Guru
Nanak dev ji**



**Enjoy special
LASER Shows
at PGSC**

Popular Beam shows

- Laung GwachaJai
- Chak De
- Brazile
- Waka Waka

Other Applications of LASER

Applications of LASER in Medicine



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

- ▣ For bloodless surgery
- ▣ To destroy kidney stones
- ▣ Cancer diagnosis and therapy
- ▣ Eye lens curvature corrections
- ▣ Fibre-optic endoscope to detect ulcers in the intestines
- ▣ Treatment of liver and lung diseases

Applications of LASER in Communications



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

Used in

- ▣ **Optical fibre communications to send information over large distances with low loss**
- ▣ **Underwater communication networks**
- ▣ **Space communication, radars and satellites**



Applications of LASER in Industries

- ▣ To cut glass and quartz
- ▣ In electronic industries for trimming the components of Integrated Circuits (ICs)
- ▣ For heat treatment in the automotive industry
- ▣ To collect the information about prefixed prices of various products in shops and business establishments from the bar code printed on the product

Applications of LASER in Science and Technology



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

- ▣ With the help of a helium-neon laser, it was proved that the velocity of light is same in all directions.
- ▣ With the help of a laser, it is possible to count the number of atoms in a substance.
- ▣ Lasers are used in computers to retrieve stored information from a Compact Disc .
- ▣ Lasers are used to store large amount of information or data in CD-ROM.
- ▣ Lasers are used to measure the pollutant gases and other contaminants of the atmosphere.

Applications of LASER in Science and Technology



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

- ▣ Help in determining the rate of rotation of the earth accurately
- ▣ Used in computer printers
- ▣ Used for producing three-dimensional pictures in space without the use of lens
- ▣ Used for detecting earthquakes and underwater nuclear blasts

Applications of LASER in Military



- ▣ Laser range finders are used to determine the distance to an object.
- ▣ The ring laser gyroscope is used for sensing and measuring very small angle of rotation of the moving objects.
- ▣ Lasers can be used as secretive illuminators for reconnaissance during night with high precision.
- ▣ Lasers are used to dispose the energy of a warhead by damaging the missile.

Types of LASERS



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

Gas Lasers	
Helium- Neon	holography, spectroscopy, barcode scanning
Argon	Retinal phototherapy (for diabetes), lithography, spectroscopy, etc.
Krypton, Xenon	Scientific research, mixed with argon to create "white-light" lasers, light shows.
CO ₂	laser cutting, laser beam welding, surgery, dental laser, military lasers.
Excimer	semiconductor manufacturing, laser surgery, LASIK.

Types of LASERS



Pushpa Gujral
SCIENCE CITY
THE SCIENCE OF **WOW**

Semiconductor Lasers	Optical discs, CDs, DVDs, Blu-ray Discs, Telecommunications, holography, printing, weapons, machining, welding, high-beam headlights for automobiles, etc.
Solid State Lasers	Material processing, holography, surgery, tattoo removal, hair removal, Surgery, LIDAR, Remote sensing
Dye lasers	laser medicine, spectroscopy, birthmark removal,
Chemical lasers	Research, Military, Aerospace
Metal vapour lasers	Printing and typesetting applications, fluorescence excitation examination (i.e. in U.S. paper currency printing), research
Others	Atmospheric research, military applications

Interesting Facts

- ▣ The world's most powerful laser has the power of a hydrogen bomb.
- ▣ Laser measuring is accurate to more than a nanometre, which is a billionth of a metre.
- ▣ Though it sounds ancient, the strength of early lasers was measured in "Gillettes," which are the number of razor blades a beam is capable of breaking through.
- ▣ The light in a laser is more parallel than any other light source; every part of the beam has almost the exact direction.

Interesting Facts

- ▣ The most powerful laser recorded was at 1.25 petawatts (10^{15}W) in a Californian laboratory in 1996.
- ▣ In 1974, lasers were used commercially for the first time in supermarket barcode scanners.
- ▣ Astronauts on the Apollo 11 space mission in 1969, used a laser to measure the distance between the Earth and the moon.



Pushpa Gujral
SCIENCE CITY

THE SCIENCE OF **WOW**

THANK YOU