“LASER”

Light Amplification by Stimulated Emission of Radiation

Samish Gakhar, TA
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.”
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

- 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.
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
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

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

- 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.
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
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

<table>
<thead>
<tr>
<th>Gas Lasers</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helium- Neon</td>
<td>holography, spectroscopy, barcode scanning</td>
</tr>
<tr>
<td>Argon</td>
<td>Retinal phototherapy (for diabetes), lithography, spectroscopy, etc.</td>
</tr>
<tr>
<td>Krypton, Xenon</td>
<td>Scientific research, mixed with argon to create &quot;white-light&quot; lasers, light shows.</td>
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<tr>
<td>Excimer</td>
<td>semiconductor manufacturing, laser surgery, LASIK.</td>
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### Types of LASERS

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<tr>
<th><strong>Semiconductor Lasers</strong></th>
<th><strong>Optical discs, CDs, DVDs, Blu-ray Discs, Telecommunications, holography, printing, weapons, machining, welding, high-beam headlights for automobiles, etc.</strong></th>
</tr>
</thead>
<tbody>
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<td><strong>Solid State Lasers</strong></td>
<td><strong>Material processing, holography, surgery, tattoo removal, hair removal, Surgery, LIDAR, Remote sensing</strong></td>
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<tr>
<td><strong>Dye lasers</strong></td>
<td><strong>laser medicine, spectroscopy, birthmark removal,</strong></td>
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<tr>
<td><strong>Chemical lasers</strong></td>
<td><strong>Research, Military, Aerospace</strong></td>
</tr>
<tr>
<td><strong>Metal vapour lasers</strong></td>
<td><strong>Printing and typesetting applications, fluorescence excitation examination (i.e. in U.S. paper currency printing), research</strong></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td><strong>Atmospheric research, military applications</strong></td>
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</table>
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.
The most powerful laser recorded was at 1.25 petawatts ($10^{15}\text{W}$) 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.
THANK YOU