

LASER

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A BRIEF HISTORY

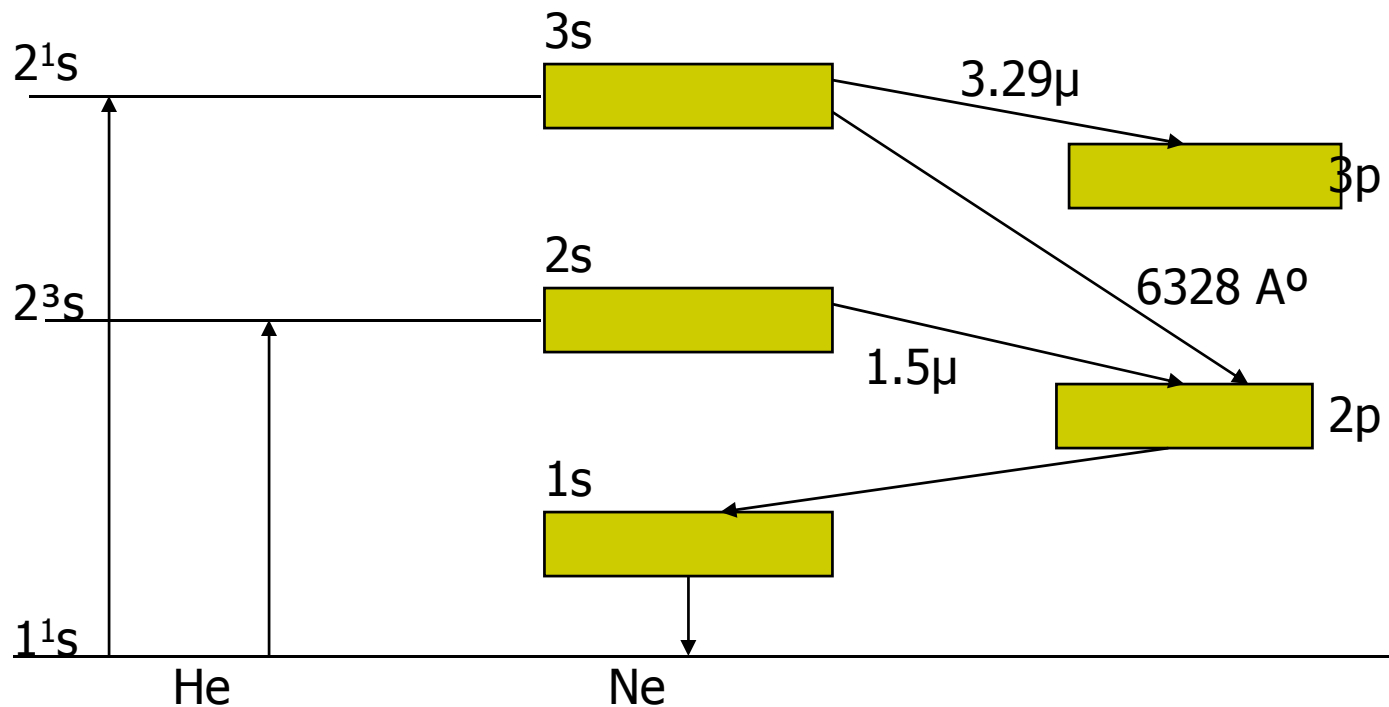
- 1917 - Einstein introduced the concept of stimulated emission of radiation.
- 1954 - Townes reported the first **Maser**.
- 1960 - Maiman reported the first **Laser** (Ruby laser).

Majority of the optoelectronic system use LASER as the light source. Why?

- ▼ Because of the advantages like
 - monochromaticity
 - coherence
 - unidirectionality
 - high intensity

Helium – Neon Laser

- Neon and helium mixed at ratio's ranging from 10:1 to 5:1, to facilitate population inversion in Neon



FIELDS OF LASER APPLICATIONS

- Chemical Analysis
- Environmental Analysis
- Materials Processing
- Inspection, Measurement and Control
- Communication
- Bio-Medical
- Laser Spectroscopy



CHEMICAL ANALYSIS

- Laser induced fluorescence
- Laser induced breakdown spectroscopy
- Raman spectroscopy

LASER-INDUCED FLUORESCENCE

- Spectroscopic method used for studying structure of molecules, detection of selective species and flow visualization and measurements.
- LIF is useful in the study of the electronic structure of molecules and their interactions.
- Successfully applied for quantitative measurement of concentrations in fields like combustion, plasma, spray and flow phenomena, in some cases visualizing concentrations down to nanomolar levels.

LASER-INDUCED BREAKDOWN SPECTROSCOPY

- Due to the high power densities achievable by lasers, beam-induced atomic emission is possible: this technique is termed Laser induced breakdown spectroscopy (LIBS).
- High power laser is used to “plasmize” a sample
- Only picograms to nanograms are used
- The spectral lines emitted from the plasma indicate the constituent elements

RAMAN SPECTROSCOPY

- The laser light interacts with phonons or other excitations in the system, resulting in the energy of the laser photons being shifted up or down.
- The shift in energy gives information about the phonon modes in the system.
- Infrared and other sources yields similar, but the informations are complementary.

ENVIRONMENTAL ANALYSIS

- Remote sensing of atmosphere
- Remote sensing of water quantity



MATERIAL PROCESSING

- Laser drilling
- Welding
- Cutting
- Image recording
- Marking or scribing
- Surface hardening
- Surface melting

INSPECTION, MEASUREMENT AND CONTROL

- Robot sensing
- Ear sensor
- Remote thermometry





COMMUNICATIONS

- Computer interfaces
- Cable TV
- Phone lines etc.

BIO-MEDICAL APPLICATIONS

- ▼ Advantages in laser surgery
 - “no touch” technique
 - dry surgical field
 - reduced blood loss
 - reduced Oedema
 - reduction of recurrence and spread
 - reduced post operative pain
 - Medical lasers can not cause genetic damage and cancer.

FIELDS OF APPLICATIONS

- Gynaecology
- ENT
- Neuro surgery
- Dermatology / plastic surgery
- Urology
- Ophthalmic surgery
- Vascular surgery



GYNAECOLOGY

- Freeing stuck tubes and ovaries
- Removing abdominal cysts and tumors
- Micro tubo plasty in patients of infertility.

ENT

- Nasal cavity or bronchi can be treated
- Nodules in a vocal chord can be treated
- Laser Tonsillectomy is the best answer for patients with bleeding disorders.

NEURO SURGERY

- To treat damage of the brain tissues
- Spinal chord tumors with minimum damage of the nerves
- Repair of damaged neurons through laser induced growth
- Reduce the occurrence of ‘strokes’



DERMATOLOGY / COSMETIC SURGERY

- Destruction and removal of tattoos
- Birth marks can be treated.



UROLOGY

- To remove tumors from the kidney
- Through endoscope to remove the prostate gland
- Destruction and removal of urinary stones

OPHTHALMIC SURGERY

- Used for the treatment of disorders of retinal blood vessels due to diabetes.
- Creates channels
- Welding a detached retina
- Used in cataract surgery





VASCULAR SURGERY

- Welding small vessels
- Treatment of coronary artery blockage
- To remove blood clots

ENTERTAINMENT WITH LASERS









Microsoft



THANK YOU