



Optics: Lets look through Lasers

Dr. T.C. Sabari Girisun

Assistant Professor

Nanophotonics Group

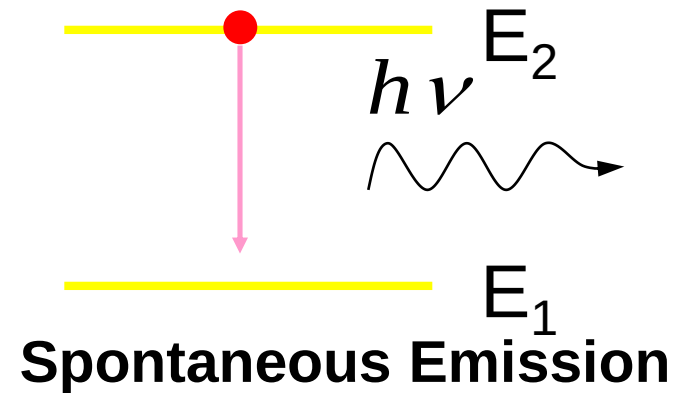
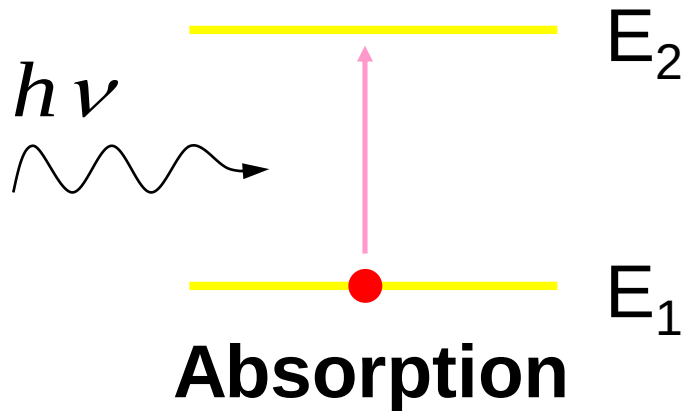
Department of Physics

Bharathidasan University

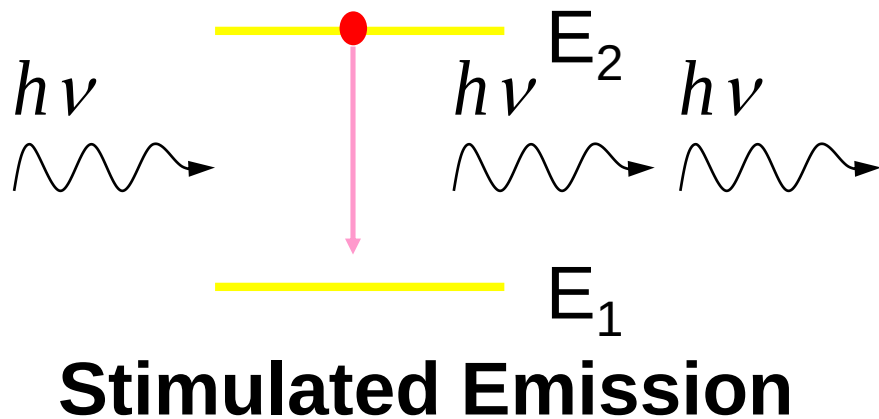
Tiruchirappalli - 620 024



Lasers – An Introduction



Interaction of Light with Matter...

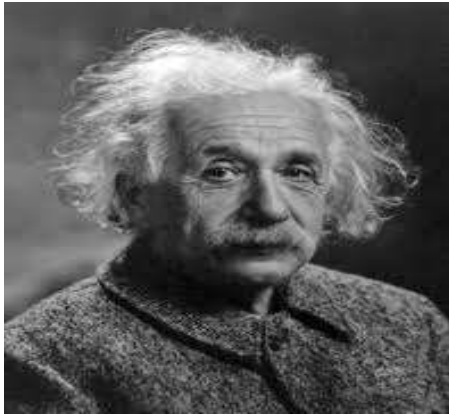


**Light Amplification by
Stimulated Emission of
Radiation**



History of Lasers

Albert Einstein



1916

Stimulated emission

Rudolf Walther Ladenburg



1928

Experiment Stimulated emission

Artur L. Schawlow



1930

Population Inversion

1950



Maser

Prokhorov and Bassov (*Moscow*)
Townes, Gordon and Zeiger (*Colombia*)



1960

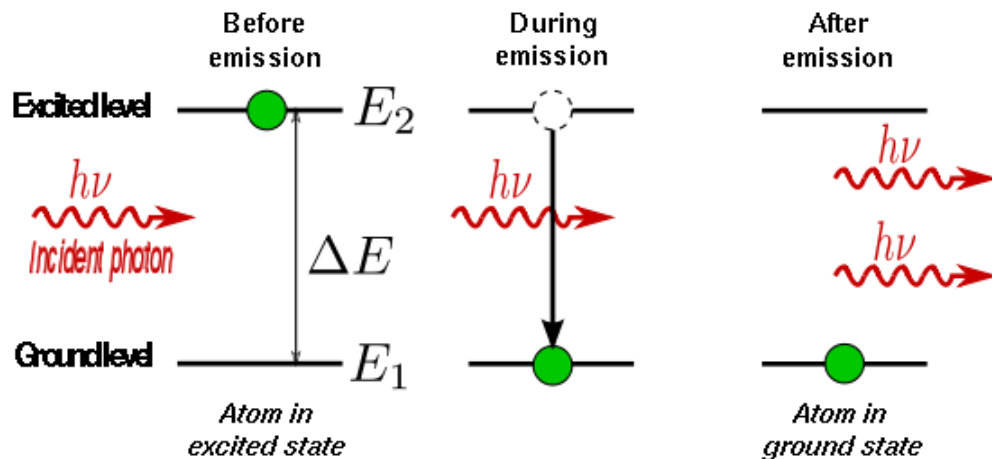
Theodore Maiman - Ruby Laser



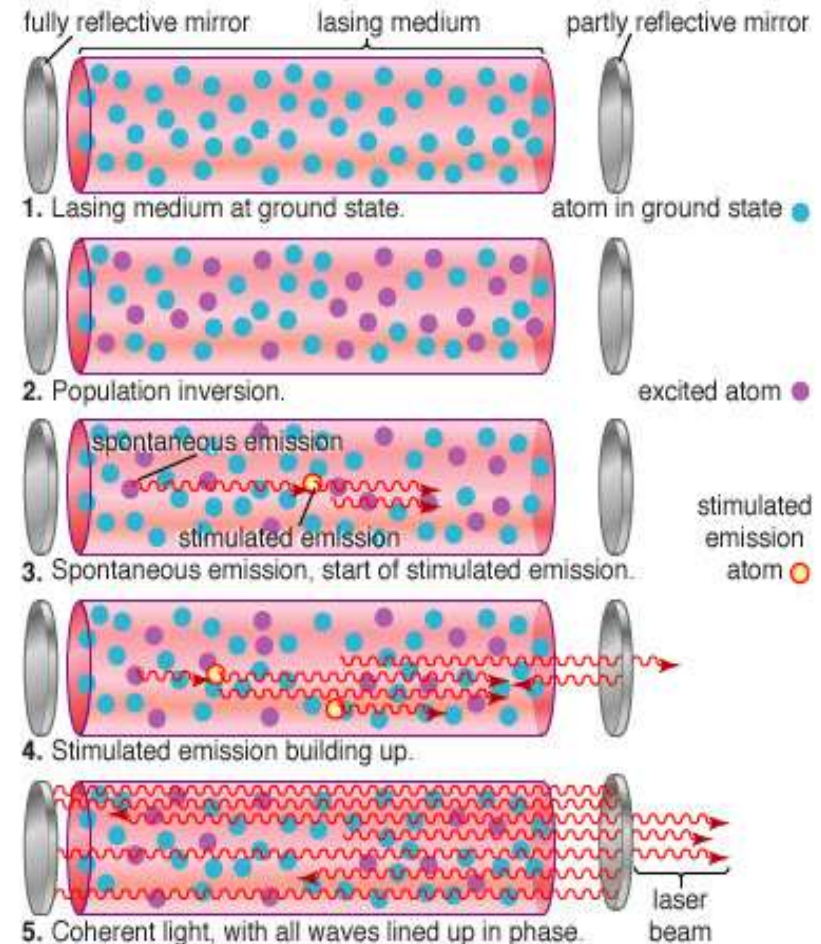
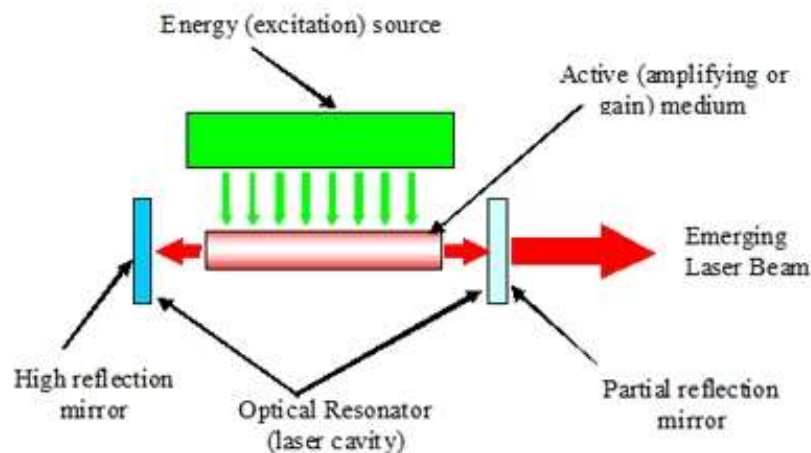
Ali Javan - He-Ne Laser



How Does Laser Works?



$$E_2 - E_1 = \Delta E = h\nu$$



Classification of Lasers



Lasers can be described by:

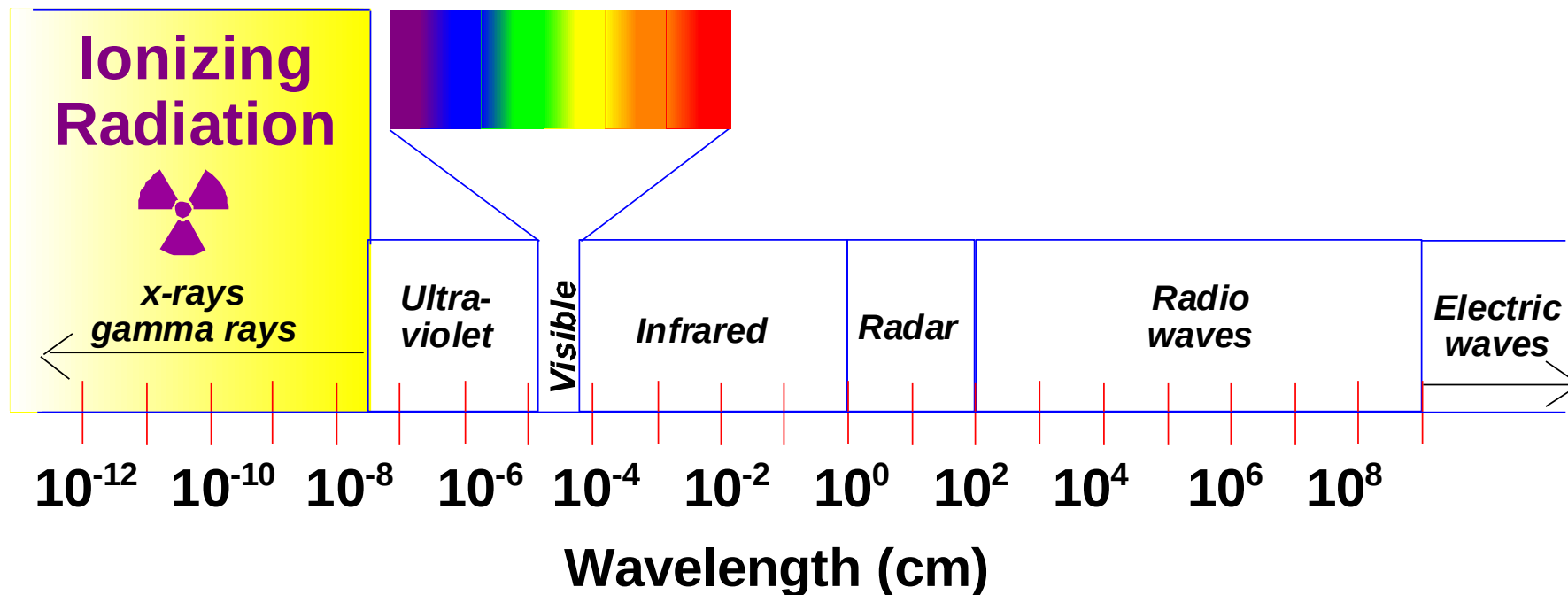
- which part of the electromagnetic spectrum is represented:
 - Infrared
 - Visible Spectrum
 - Ultraviolet
- the length of time the beam is active:
 - Continuous Wave
 - Pulsed (ns, ps)
 - Ultra-short Pulsed (fs)
- **Conventional Lasers and USP Lasers**



Is **L** of Laser Covers Entire EM Spectrum?

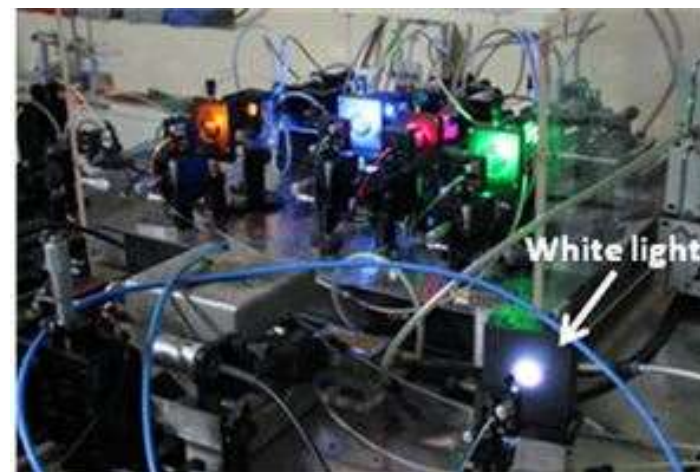
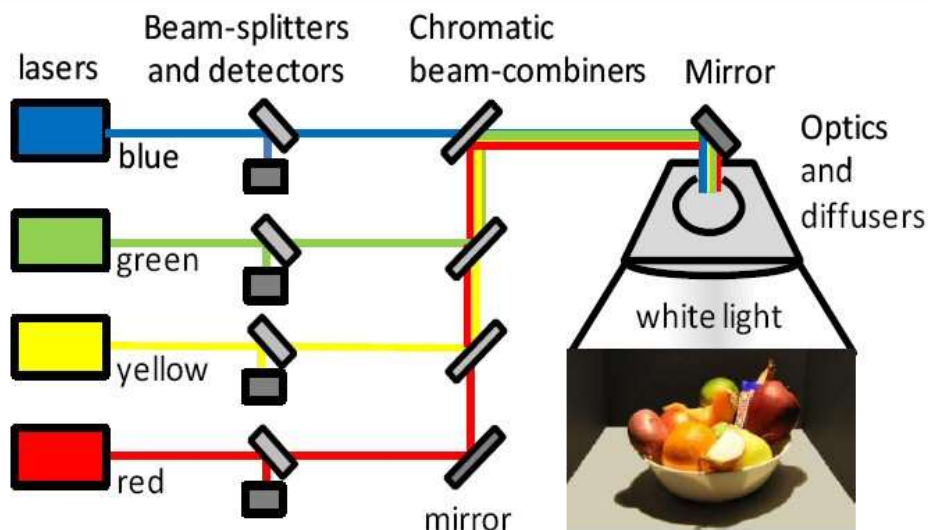
Laser wavelengths are usually in the Ultraviolet, Visible or Infrared Regions of the Electromagnetic Spectrum.

The Electromagnetic Spectrum





White Super Continuum Lasers



Laser Lighting

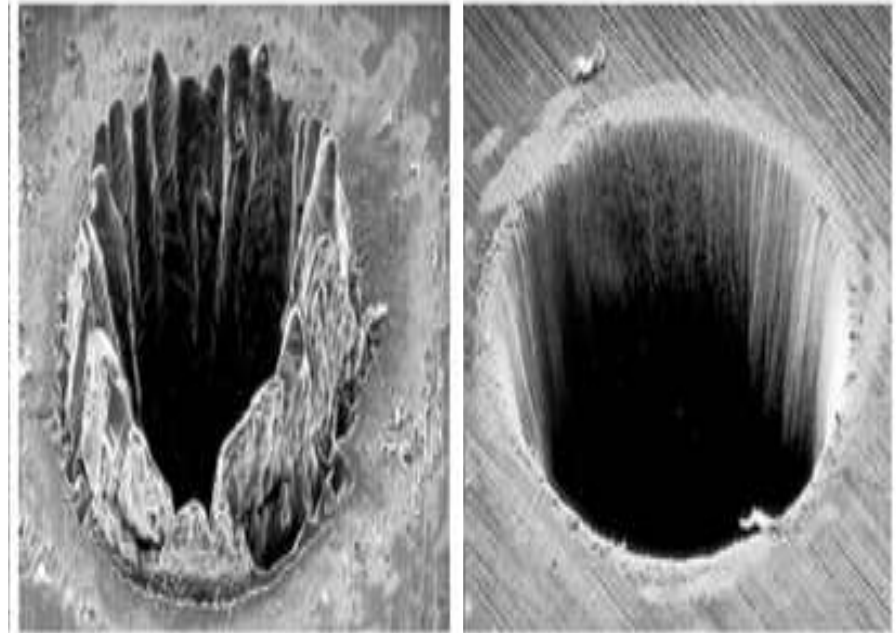
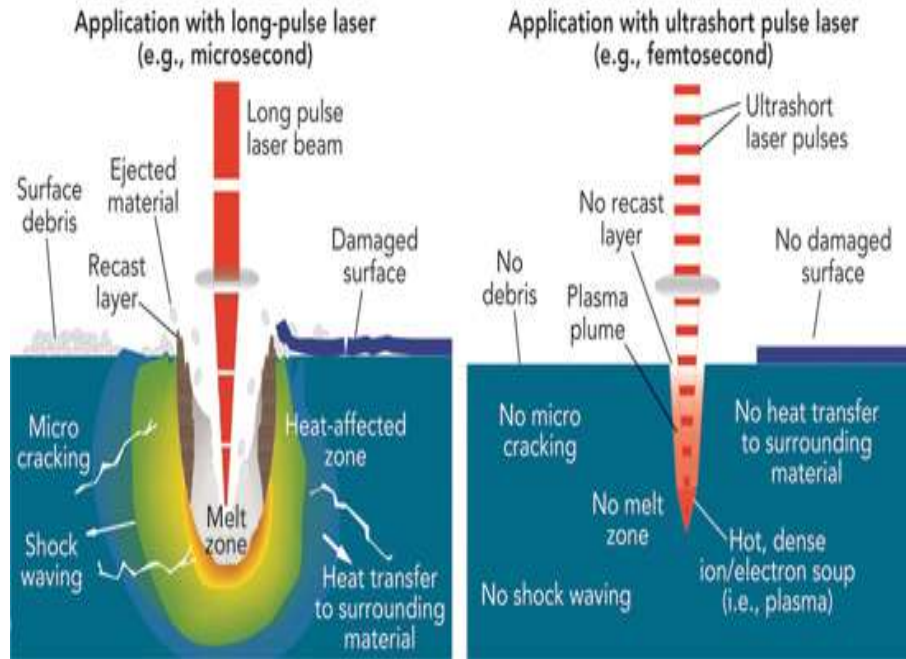
Incandescent Lighting



BMW i8 – First car to use white lasers as headlights



Long Pulsed VS Ultra Short Pulsed Lasers



Laser interaction with material under long and ultra-short pulse mode

Laser drilling on metal surface with nano-pulsed and femto-pulsed laser



Applications of Lasers

**Laser: a solution
looking for a problem
(1960)**

List is growing...

**Laser is everywhere
and is unavoidable
(present scenario)**

