

LASER: Light Amplification by Stimulated emission of radiation. It is a source which emits an intense, almost perfectly monochromatic, directional, and highly coherent beam of light.

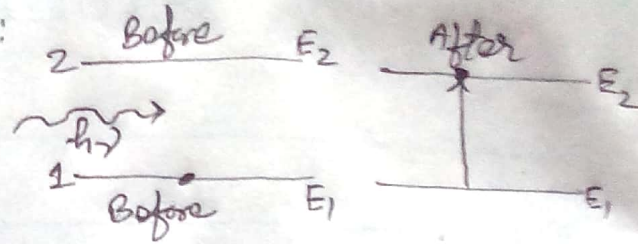
Interaction of radiation with matter:

(i) Stimulated absorption of Radiation:

An atom initially in a lower state 1, raises to a higher state 2 by absorbing a quantum radiation (photon) of frequency ν , given by

$$\nu = \frac{E_2 - E_1}{h}$$

where E_1 and E_2 are the energies of the atom in the states 1 and 2, respectively. This is stimulated absorption of radiation, being the stimulating photon.

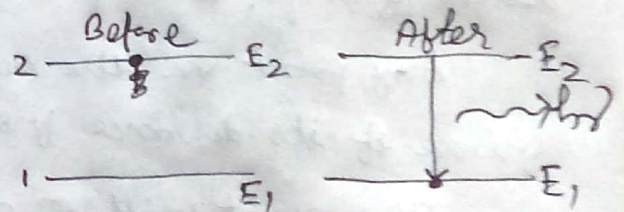


Spontaneous Emission of Radiation:

Let us now consider an atom initially in the higher (excited)

energy state 2. Its life time in higher state is usually very small ($\approx 10^{-8}$ second) and it decays to the lower energy state 1, emitting a photon of frequency $\nu = \frac{E_2 - E_1}{h}$.

If there ~~are~~ is an assembly of atom then the radiation emitted by each atom spontaneously has a random direction and a random phase.



Stimulated emission of Radiation: An atom in an excited state under the influence of the electromagnetic field of a photon of freq. ν incident upon it, decays to a lower energy state, emitting an additional photon of same frequency ν . Thus two photons of same frequency, one incident and other emitted. This is stimulated emission of radiation. The direction of propagation, energy, phase and state of polarisation of the emitted photon is exactly the same as that of the incident stimulating photon.

