Coherence

Laser source gives photons having same phase so LASER are highly coherent. Quantitatively coherence is given by:

$$\text{Coherence time}(t_c) = \frac{1}{\Delta v}$$

$$\text{Coherence length}(L_c) = \frac{c}{n\Delta v} \quad \text{where,}$$

c = velocity of light Δv = emission line width n = refractive index of medium

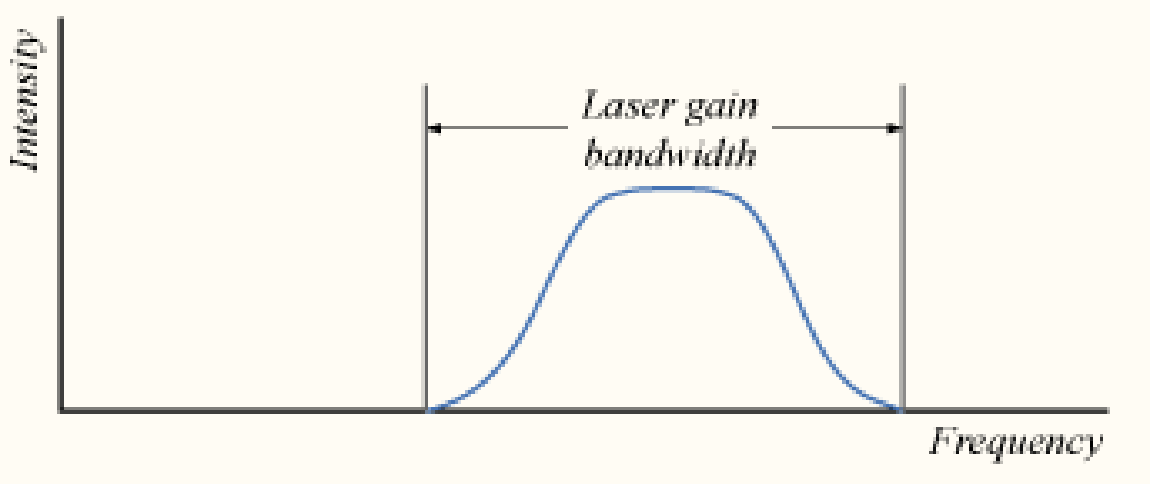
If $L < L_c$ than photon are correlated to each other in phase.

Holography is an interesting example which utilize this highly coherent nature of LASERs.

Monochromaticity

- Laser are highly monochromatic because of narrow line width which arises due to various line broadening classified as:
  - Homogenous broadening
  - Heterogenous broadening

  The resulting spectrum has distribution of frequency called as gain bandwidth(Δv).



Modes in a Laser output

Separation between various modes of Laser is given by: $\Delta vm = \frac{c}{2L}$

c = velocity of light L = length of Laser cavity

No. of Modes in Laser output = $\frac{\Delta v}{\Delta vm}$