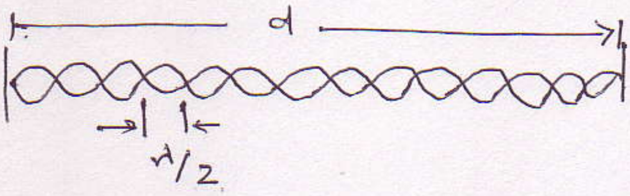
Lasers.

Here all the equations of standing waves are same.



mirror spacing = d

Standing wave envelope length = $\lambda/2$

In a typical laser cavity, about 1 million half waves fit into the length of the cavity.

$$d = m\left(\frac{\lambda_m}{2}\right) \quad — \quad (1)$$

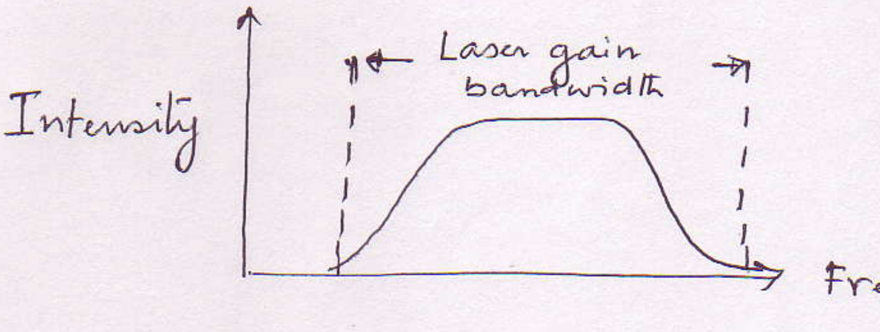
m = mode order
usually very large ($10^5 - 10^6$).

$$\lambda_m = \frac{2d}{m} \quad — \quad ''$$

$$\nu_m = \frac{c}{\lambda_m} = m\frac{c}{2d}$$

The most important idea:

The light emitted by the atoms in a laser tube is monochromatic but still it has a small spread. That is from $\lambda_1 \longrightarrow \lambda_2$. Now all these λ_i which falls between λ_1 and λ_2 does not satisfy the first equation. Only few of them will satisfy them — those are the frequencis which will allowed. Let us see the example.

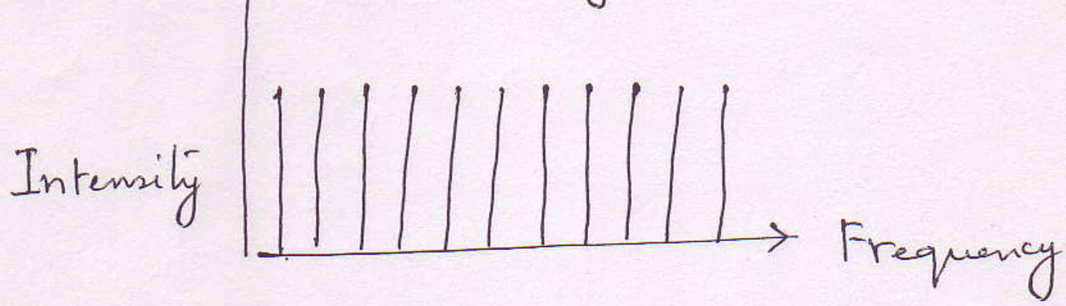


For He Ne laser

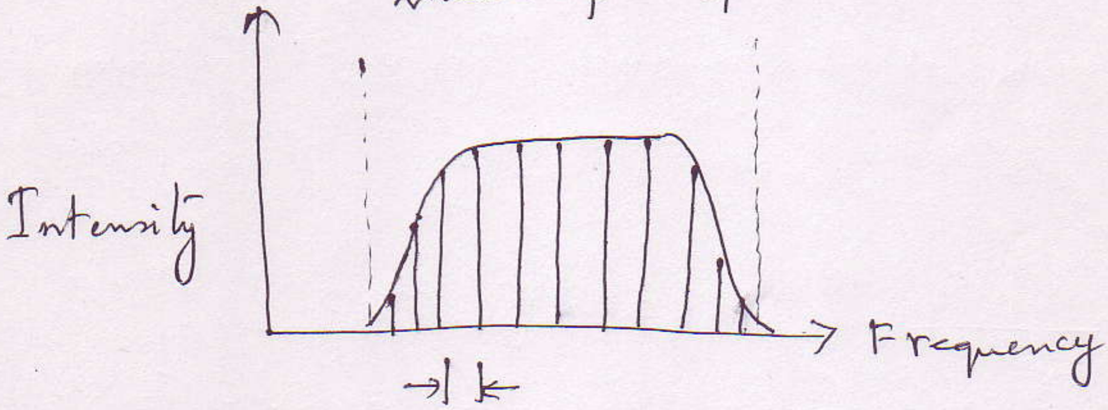
1.5 GHz.

0.002 nm.

Cavity longitudinal mode structure.



Laser output Spectrum.



$$\delta\nu = \frac{c}{2L}$$