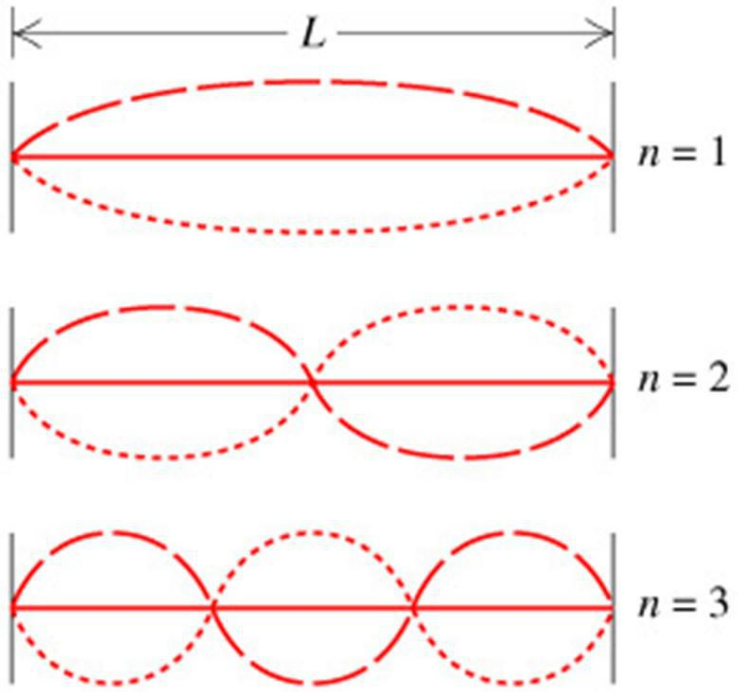
Longitudinal modes of LASER cavity

- In LASER Cavity only those modes can sustain which creates a standing wave.

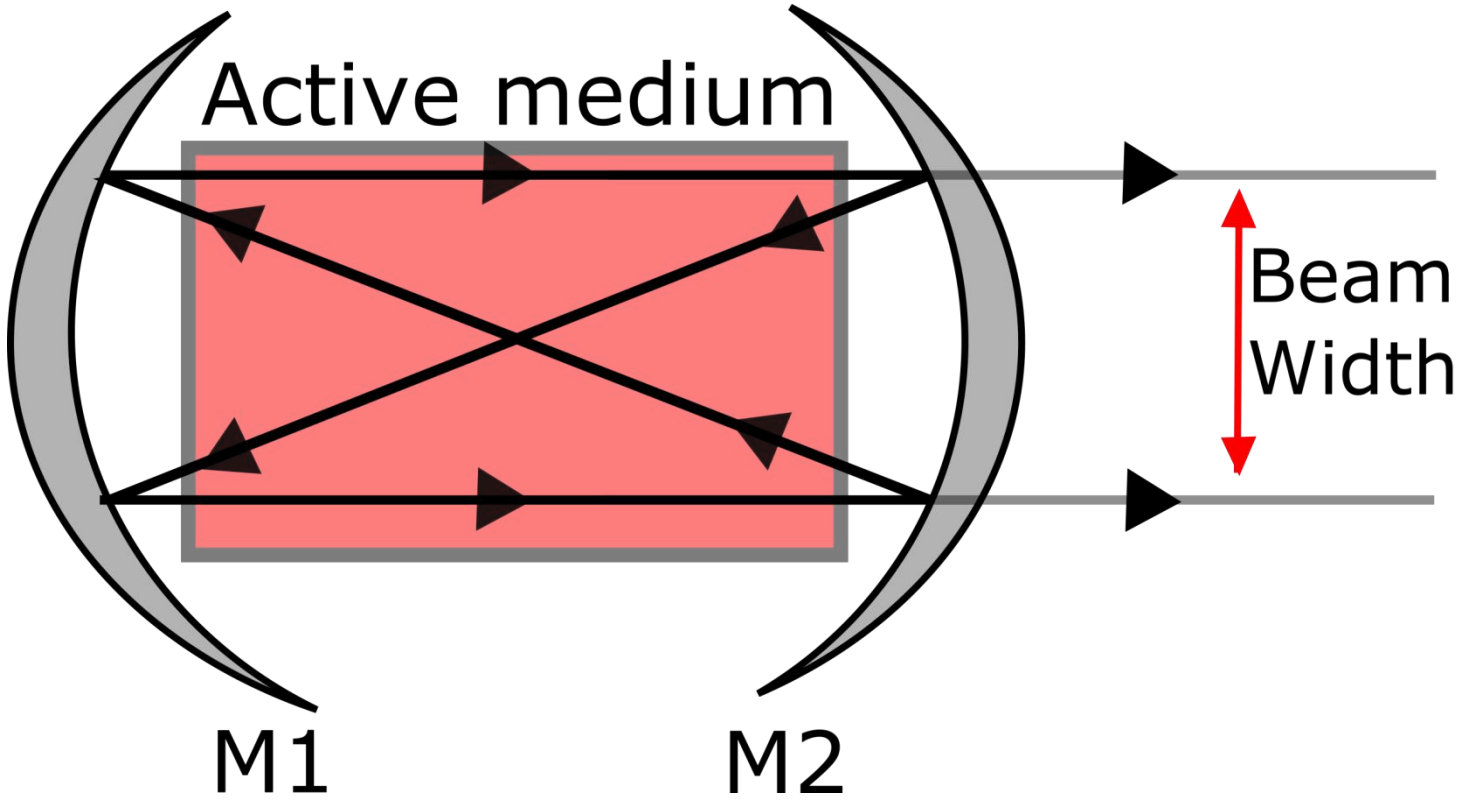
Condition for sustaining a mode: $n\lambda = 2L$ $n = 1,2,3,4 \ldots\ldots$

n = order of mode, λ = wavelength of light, L = length of cavity.



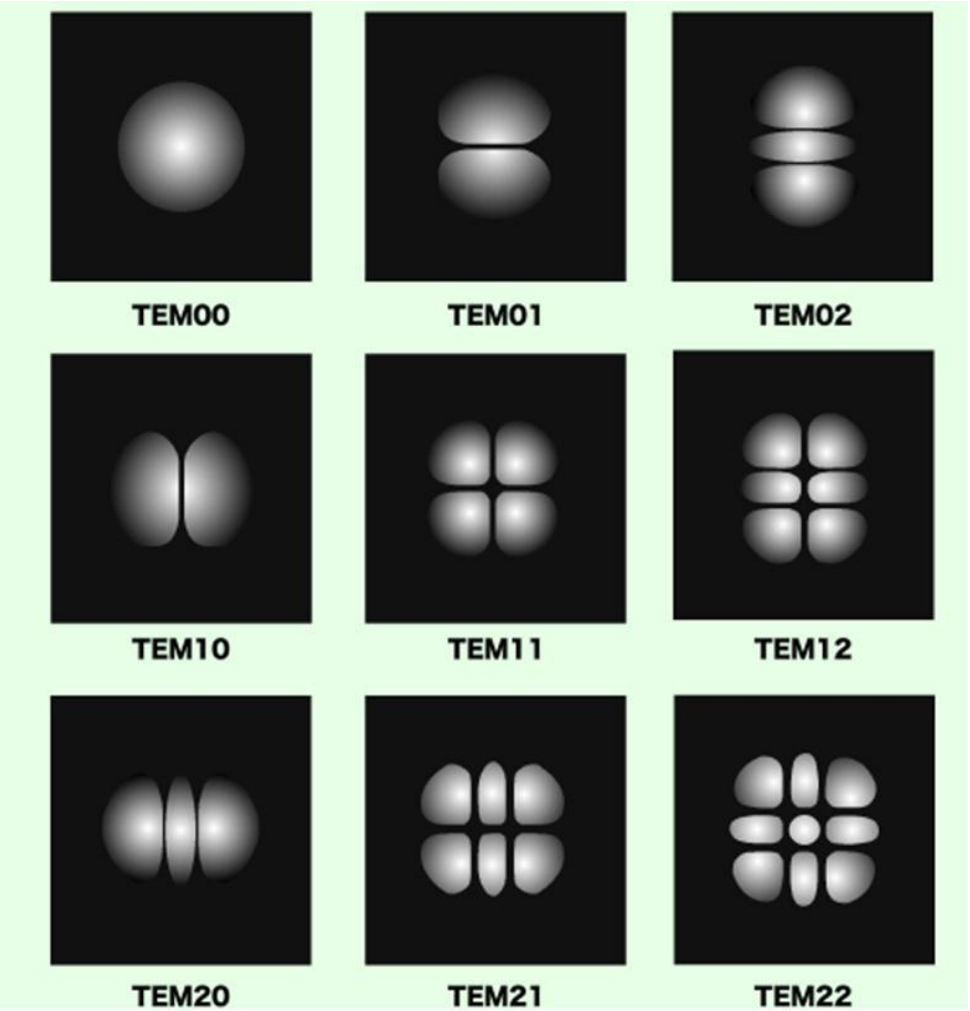
Advantage of curved mirror cavity

- Low losses in comparison to plane mirror cavity , as it does not allow the off axis photons to go out of the cavity.



Transverse Electromagnetic Mode (TEM)

- The transverse modes determine the intensity distributions on the cross-sections of the beam.
- A TEM mode is described as TEM_{pq}, where p and q are the indices of the mode.
- We will use the convention where p corresponds to number of nodes in horizontal direction and q corresponds to number of nodes in vertical directions.



Transverse Modes

Threshold Condition

Rate of change of intensity of stimulated photons:

$$\frac{dI}{dt} = (N_2 - N_1)BhvI$$

N_2 = population of excited state , N_1= population of ground state

B = Einstein coefficient, v = frequency of emitted photons.

Taking degeneracy in account:

$$\frac{dI}{dt} = \left(N_2 - \frac{g_2}{g_1}N_1\right)BhvI$$

g_1 = degeneracy of ground state, g_2 = degeneracy of excited state.