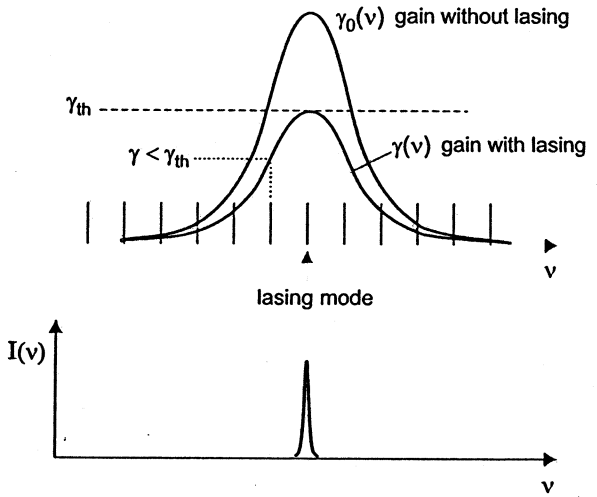


# Mode Spectrum of Laser Light

## Single mode operation

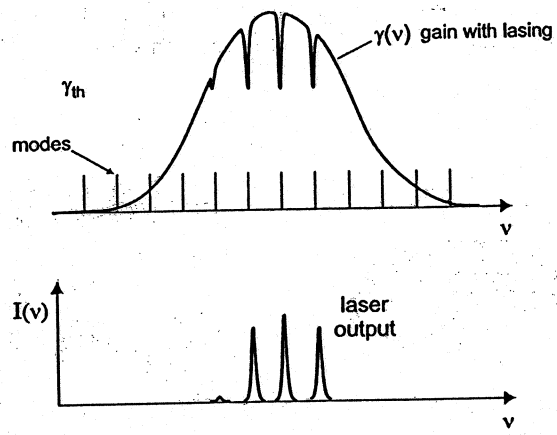
- \* homogeneous broadening
- and
- \* uniform light intensity



## Multimode operation

Results with either 1) inhomogeneous broadening or 2) non-uniform mode intensity

1) Inhomogeneous broadening (spectral hole burning)

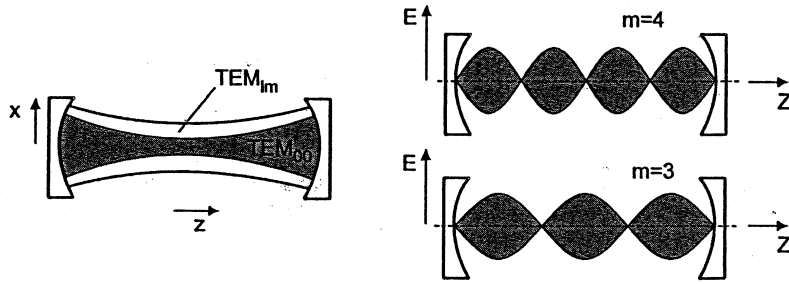


\* Doppler effect in gases  

$$\nu'_0 = \nu_0 \left(1 \pm \frac{v_z}{c}\right)$$

\* different sites for ion in solid (Stark effect)

2) Non-uniform mode intensity  
(spatial hole burning)



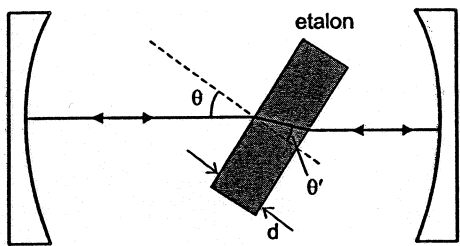
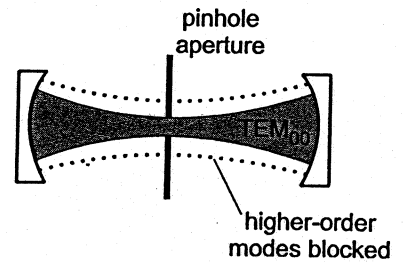
transverse modes

longitudinal modes

These cause inefficient use of pump energy

Achieving single-mode operation:

- 1) Single transverse mode:
- 2) Single longitudinal mode:



$$\delta \nu_{\text{etalon}} = \frac{c}{2nd \cos \theta'}$$

