

ACRHEM – Laser Primer

Assignment 7

07-11-09

Submission date : 10-11-2009

1. A cavity has a mirror separation of 0.5 m.
 - a. What is number of longitudinal modes this cavity can support?
 - b. What are the minimum and the maximum frequencies?
 - c. What is the separation of two consecutive modes?
2. A He Ne laser is made from the above cavity.
 - a. How many L-modes can be supported?
 - b. What is the mode number of these modes?
 - c. What are the wavelengths of these modes?
 - d. If the cavity length changes by 1 μ , what are changes w.r.t a-c ?
3. Draw the graphs –
 - (a) $S(x) = 21 \frac{x}{2} \exp(-\frac{x^2}{4})$
 - (b) $S^2(x)$
 - (c) $F(x) = 32 \frac{(4x^2 + 2)}{3} \exp(-\frac{x^2}{9})$
 - (d) $F^2(x)$
4.
 - a. Write down the E field equation for a TEM_{m,n} mode.
 - b. What is the corresponding expression for the Intensity?
 - c. What are the resonant longitudinal frequencies of a TEM_{m,n,q} mode ?
5.
 - a. Briefly explain the differences between the fundamental mode and the higher order Transverse modes.
 - b. How Transverse mode selection is achieved?
 - c. How Longitudinal mode selection is achieved?
 - d. Briefly explain in what kind of applications one needs a G Beam/Higher order modes?
6. Complete the following table –

Laser	Gain Bandwidth	No. of Longitudinal modes (typical)
He-Ne		
Nd:YAG		
Nd:Glass		
Ti:SAP		
Dye		