ACRHEM – Laser Primer

Assignment 6 **5-10-09**

Submission date 12.10.09

1. Derive a relation between the far field divergence after the lens in terms of the far field divergence before the lens.

2. A Gaussian beam with the following parameters is incident onto a convex lens.

   f =10 cm, d_0 = 20 cm,W_0 = 0.1 mm and λ= 0.63 μm

   1. Rayleigh range of the input beam
   2. Beam waist of the emergent beam
   3. Magnification
   4. Location of the beam waist after the lens.
   5. The divergence of the input beam
   6. The divergence of the emergent beam
   7. The Rayleigh range of the emergent beam.

3. A Gaussian beam with the following parameters is incident onto a convex lens.

   f =20 cm,d_0 = 20 cm,z_0 = 785 μm & λ= 0.4 μm

   Calculate
   (a) Beam waist of the input beam
   (b) Beam waist of the emergent beam
   (c) What the magnification
   (d) Location of the beam waist after the lens.
   (e) The divergence of the input beam
   (f) The divergence of the emergent beam
   (g) The Rayleigh range of the emergent beam.

4. Find out the wavelength of laser used in a CD, DVD and Blue ray RW disc drive of a computer. What is the focusing geometry used in these systems? What is the typical beam waist size achieved?
5. Under what conditions, the expression for the position of the beam waist after a thin lens can be written in the form of $\frac{1}{f} = \frac{1}{d_0} + \frac{1}{d_1}$