PHGN 480 Laser Physics

Lab 1: Basic alignment skills, working with laser beams, mirrors and lenses. *Do this by the end of the day Monday, 5 September.*

Equipment: HeNe or green alignment laser 2 or 3 irises on posts 2 mirrors, mirror mounts 3 lens mounts, lenses (check out lenses from Chip or Rezwan) posts, post holders, bases (located in cabinet in adv lab. Return when you're done.)

Align the beam to be level and straight to the table holes:

1. Set up an alignment laser: either the green DPSS laser or a HeNe laser, pointing the beam roughly parallel to the table surface and parallel to the table holes.

2. Mount two mirrors in mirror mounts, with posts, post holders and bases. Keep the mirror surfaces clean and scratch-free! Mount them to the table so that the beam will turn 90 degrees twice.

3. Set up two irises in post holders on bases. Pick a beam height, and set the first iris to that height. Place an iris near the second mirror and adjust the first mirror so that the beam goes through the iris. Then take that iris out (post holder and all), then place the second iris in the same position. Adjust the height of that iris so that it is centered on the beam. Leave that iris in place, then place the second iris farther along the beam path, around 1 to 2 feet from the first.

4. Iterate between the adjustments of the mirrors so that the beam ends up going through the center both irises. Develop a strategy for doing this alignment, and write down your procedure for aligning the beam through the irises.

Expand the beam by a factor of 2 or 3 and collimate it:

1. Pick a pair of lenses that you can use as a beam expander. Make a sketch of your beam expander, marking on the drawing the focal lengths of the lenses and the expected separation between them.

2. Put the first lens in (after the second iris). Come up with a procedure for ensuring that the lens is centered on the beam, and that it is not twisted with respect to the beam. Write down your procedure for aligning the lens, including any sketches that might help explain.

3. Install the second lens, and adjust the lens separation to collimate the output beam. The easiest way to test for collimation is to let the beam travel a distance, and look to see if the beam stays the same size as it propagates. Do this first, then try putting in a positive lens of known focal length and use the knife edge test (shown in class) to determine the position of the focal point.

Write down any observations or questions that came up while you did this lab.