

PHY 202/182 Lab Instructor notes
Lab 11: Interference and the Hydrogen atom
Spring 2004

- There should be *at least* four lasers set up. There is only 1 HeNe laser still working; we need to purchase another. There are several diode lasers available. They require a power supply set to between 3 and 4 volts. They also have “on” switches which must be pressed. (I will eventually solder in a bypass.)
- Another interesting thing to do is to measure the width of a human hair using the interference pattern.
- The diffraction gratings and slits are stored in the drawer labeled “optics.”
- We need some nicer holders for the slides holding the diffraction gratings. I just used some of the clamps.
- The microscope measurement is the most problematic part of the lab. Discuss how to do this at the beginning of the lab.
 1. The micrometer screw on the microscope has a bit of “play.” Students should turn the dial in one direction only while measuring distance between two slits.
 2. The distance between slits is measured from the center of one slit to the center of the other slit. Draw a picture on the board illustrating this. (Should add a picture in the lab manual, since they always get this wrong.)
 3. Have two lab partners make *independent* measurements.
 4. This part of the lab should be replaced by a nice measuring microscope from Edmund Scientific.

The microscope needs periodic application of grease so that it runs smoothly. Else there is a lot of “sticking.” The hair across the middle of the screen is missing. The microscope needs two light sources: one for illuminating the slide from below and the other so that students can read the dial.

- If the diode laser is mounted on a vertical rod, you should also set up a cross brace and another vertical rod so that it can be adjusted easily.
- You should mention:
 - The diffraction gratings are fingerprint sensitive.
 - Staring at the laser light can result in permanent eye damage. You might want to discuss the power output of the laser relative to that of a light bulb.
- Use the wave-tank demo to explain what is going on.
 - The projector is borrowed from AV.

- When you are done, the metal blocks should be removed from the water and dried: else they corrode. Also, the wooden “door” should be raised out of the water.
- The result from the two-slit part should be about 630 nm: make sure students get this part right or the rest of the lab won’t work.
- I let the students set up the interference part on their own. They can use string to more easily measure the distances.
- At the end of lab: cover up the microscope, collect the slits and diffraction gratings, and turn everything off.