LAB 7 WAVELENGTH OF A LASER

EXPERIMENTAL GOAL

Your goal in this laboratory is to measure the wavelength of a helium-neon laser using the wave nature of light.

PROCEDURAL COMMENTS

Each group will be given a helium-neon laser, a set of single slits of various widths and a set of double slits with various widths and spacings. Use the interference and diffraction patterns produced by one of each kind of slit arrangement to measure the wavelength of the laser and see if your results are consistent.

You should think carefully about what you can do to improve accuracy of your measurement, because we will be using the results in future labs as a baseline to determine other wavelengths. Some of things you should consider are:

1. where to place the screen you use to observe the interference pattern with respect to the slit,
2. which slit you use in each set of slits,
3. which part of the interference pattern you should use for your measurement,
4. how you can measure the width or separation of the slits, and
5. how you can perform repeated measurements.

Some of these issues are related, so don't just think about each one separately. Request a procedure interview with your helper before you start taking very many measurements.

CHECKOUT INTERVIEW

At the end of the lab, you should be able to tell your grader a result (with uncertainty) for the laser's wavelength according to measurements made from a single-slit diffraction pattern and another result (with uncertainty) for the wavelength using a double-slit interference pattern. Make sure you can explain your approach to the issues listed above, how you calculated your uncertainties, which method (the method using the single slit or the double slit) leads to the least uncertainty.

There will be a prize awarded for the result with the least uncertainty that encloses the laser's accepted wavelength as found in the scientific literature.