

Lab #8 -- Shearing Interferometer

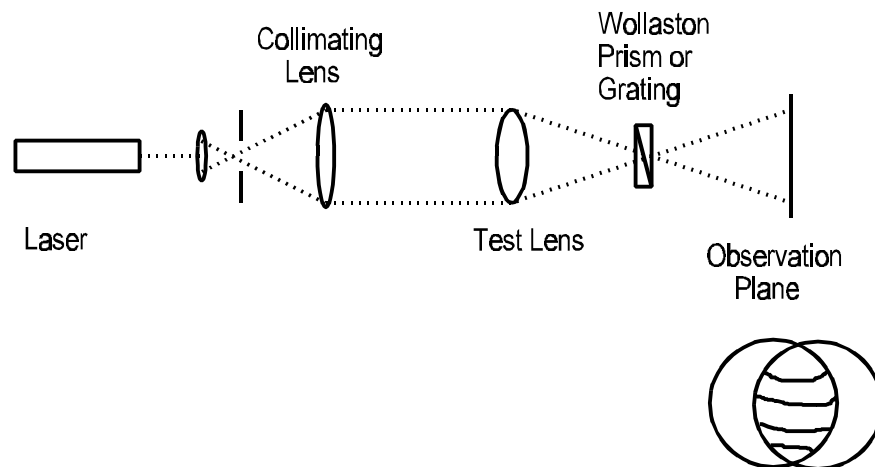
The purpose of this lab is to become familiar with three different lateral shear interferometers.

Preparation:

Review lateral-shearing interferometry and how the interferogram is related to the wavefront. Understand how interference takes place in all the interferometers, especially at Wollaston prism. See Chapter 4 of Malacara Optical Shop Testing, and sections 8.3, 8.4 and 8.7 of Hariharan Interferometry.

Polarization Interferometers:

- 1) Place the Wollaston prism at the focus of the lens under test which is illuminated by a collimated beam. Note that the Wollaston is to be mounted between crossed polarizers at 45° to the crystal axes.
- 2) Observe an interferogram produced by defocus. Then turn the lens around and look at the interferogram due to spherical aberration. Sketch what you see. Tilt the lens and try to determine what aberrations are present.

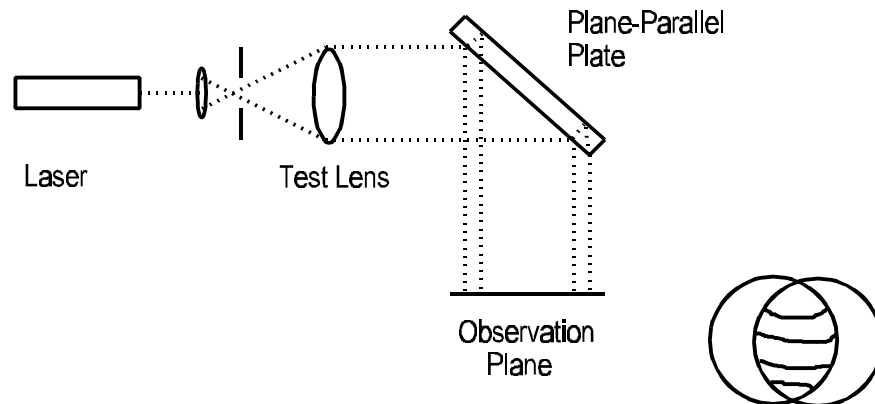


Double Frequency Grating:

- 1) Place the double frequency grating near the focus of the test lens. Four interferograms should be seen because there are two gratings at different frequencies in both the x and y directions.
- 2) Repeat 2) of the polarization interferometer section.
- 3) Make a rough estimate of the frequencies present in the grating which produce the interferograms.

Plane-Parallel Plate:

- 1) Set up the following arrangement.



- 2) Repeat 2) of the polarization interferometer section.

Questions:

- 1) Why is an analyzer needed after the polarization interferometer?
- 2) Would the polarization interferometer work in white light? Explain.
- 3) Will the plane-parallel plate produce fringes with a white light source?
- 4) How would you modify the grating interferometer so you could vary the shear?
- 5) Describe the parameters which determine the amount of shear produced in each of the interferometers.

- 6) Compare the results of the three interferometers. Which is more accurate? Which is easier to use? etc.
- 7) Each of these interferometers produce a pseudo derivative. What advantages and disadvantages do you see relative to an interferometer like a Twyman-Green which shows the wavefront directly?