

Optics 513 - Optical Testing and Testing Instrumentation Lab

Lab #7 - Foucault, Wire, and Ronchi Tests

The purpose of this lab is to obtain "hands on" experience with the Foucault (knife-edge), wire, and Ronchi tests.

Procedure:

- Test the parabolic mirror at the center of curvature using the Foucault test. Scan in both horizontal and longitudinal directions and note how the test pattern changes. Estimate how much aberration is present.
- Test the parabolic mirror at the center of curvature using the white light Ronchi test. Scan in both horizontal and longitudinal directions and note how the test pattern changes. Estimate how much aberration is present.
- Setup the laser, spatial filter, and collimator to produce a collimated beam. Put the focusing lens in the collimated beam. Put the Ronchi grating at the focus of the lens to test the lens. Scan in both horizontal and longitudinal directions and note how the test pattern changes. Turn the lens around and re-test the lens. Tilt the lens and try to obtain hyperbolic and elliptical patterns.
- Replace the Ronchi grating with a wire (hair). Scan in both horizontal and longitudinal directions and note how the test pattern changes. Turn the lens around and re-test the lens. Tilt the lens and note how the wire shadow changes.

Questions:

Foucault Test

- 1) Describe the results obtained from longitudinal and transverse tests of the lens.
- 2) What is the measured transverse aberration?
- 3) How accurate is this test?

Ronchi Test

- 4) Sketch Ronchigrams obtained using each of the Ronchi rulings supplied.

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- 5) Which grating is best for testing the lens? Which grating is best for testing the mirror?
- 6) Describe the diffraction effects.
- 7) Estimate how accurate this test is.
- 8) What happens to the Ronchigram as the ruling is moved longitudinally?
- 9) What is the shear between zero and first orders produced by a 200 line/inch grating?

Wire Test

- 10) Observe and sketch patterns for different longitudinal positions of the wire.
- 11) Compare the results of this test to those of the Foucault and Ronchi test of the same lens.

All Tests

- 12) Which technique has the highest accuracy? What factors influence your judgment?
- 13) What differences do you notice when using the collimated laser source for the Ronchi test instead of the white light source? Which source provides the best results? Why?