

Optics 1 Grading Rubric, Spring 2008

Session #1 (40 pts.)

- I. Intensity Profile of Unexpanded Beam
 1. image of unexpanded beam **2 pts.**
 2. profile of unexpanded beam **2 pts.**
 3. diagram **2 pts.**

- II. Beam Expansion
 1. image **2 pts.**
 2. profile **2 pts.**
 3. diagram **2 pts.**

- III. Calibration of the CCD
 1. image **2 pts.**
 2. diagram **2 pts.**
 3. calculation and discussion. **4 pts.**

- IV. Analysis of Beam Intensity Profile
 1. Gaussian fits plotted on top of intensity profile data for unexpanded and expanded beam, with explanation of how the fit was performed, and an equation showing the parameters they adjusted. **5 pts.**
 2. $1/e^2$ radius for expanded and unexpanded beam **5 pts.**
 3. calculated magnification of beam expander, comparison with experimental results, if disagreement (most likely because of diverging beam) then some hypothesis and perhaps some additional measurements to prove hypothesis (e.g. measuring beam diameter at different distances from the source). **10 pts.**

One page draft shown at the beginning of Session #2 (10pts)

Session #2 Optical Diffraction in two dimensions (50 pts)

- I. Determination of the Fresnel and Fraunhofer (far field) regions for both the 200- and 300-mesh grids. Illuminate (in transmission) a 300-mesh Cu grid of square apertures with the (unexpanded) laser.
 1. Calculation of L_0 **4 pts.**
 2. 10 images (5 distances, two grids) showing Fresnel-to-Fraunhofer transition **6 pts.**
 3. discussion of observations (how pattern changes with distance, effect of translation of grid on pattern at different distances, comparison of different

distances where similar patterns were observed for the two different grids and relating that to ratio of L_0s). **10 pts.**

4. diagram **2 pts.**

II. Determination of lattice constant from the diffraction pattern.

1. 2 diffraction patterns (one from each grid) **2 pts.**

2. profiles **2 pts.**

3. FWHM of individual peaks, and a comparison to expected peak width **4 pts.**

4. lattice constants measured from the diffraction patterns, comparison to theoretical value. **8 pts.**

5. diagram **2 pts.**

III. Determination of width of wire using variation in diffraction spot intensity

1. good diffraction pattern showing wide range of diffraction angles for each grid (two diffraction patterns). **2 pts.**

2. determination of wire width d for each grid **8 pts.**

3. diagram **2 pts.**