

OPTICS 380A

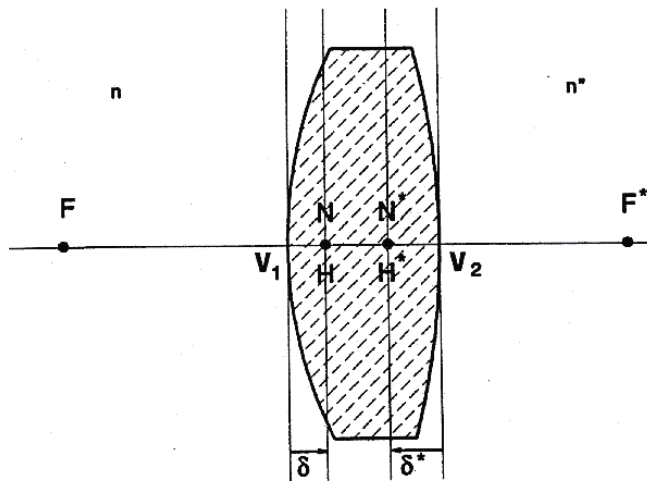
Lab 4: CDROM

Introduction

The purpose of this laboratory is to learn about the operation of a dvd drive by taking one apart. Each lab group is given a fully assembled drive and your team must disassemble the drive.

Lab procedure and questions:

- (1) Disassemble the drive and isolate the optical assembly. Show them to the T.A. and identify the laser diode, the lens and the detector.
- (2) How many motors are there inside the drive? What is the function for each of the motor?
- (3) The lens is mounted on magnetic coil actuators. How many and in what directions can the lens move?
- (4) Take a look at the lens using a magnifying glass. What color is the lens? Does the lens have anti-reflection coating?
- (5) Remove the lens from the lens assembly. If you have problem removing the lens, ask the T.A. for a lens that has already been removed. Use the nodal slide setup and measure the front focal length of the lens.



- (6) Estimate the numerical aperture of the lens, assuming that 90% of the lens diameter is useful for the beam?
- (7) Assume the lens is diffraction limited, $\lambda=650\text{nm}$ for DVD drive and $\lambda=780\text{nm}$ for CDROM drive, what is the spot size of the beam using the numerical aperture from (6)? (Hint: $D=1.22\lambda/\text{NA}$)
- (8) Next you will measure the eye diagram of the DVD player. Put a DVD into the player. Press Top Menu then Clear then ON/OFF. Wait 5 seconds for the service screen to show up on the TV. Press 2 Drive Manual Operation. Press 1 Servo Control. Then turn on LD, SPDL, Focus etc. by pressing 2, 3, 4, 5, 6, 7. Basically turn everything ON. The disk should be spinning and DVD

player is now reading the disk. Connect the pin 4 to the scope (ask TA for help). Draw a picture of the eye pattern. How many curves (different heights) are there? Each curve corresponds to data pits of different lengths. Next Press 0 to return to previous menu. Press 3 Manual Adjustment. Press 2 Gain Adjust. Press the down key to reduce the gain to zero. Observe the changes in the eye pattern and if you hear anything. Explain what happened. Turn off the DVD when you are done for the next group.

- (9) Extra credit: remove the diffraction grating from the optical assembly. Put diffraction grating into the measurement setup. Measure the separation of the diffraction spots and calculate the periodicity of the grating. The grating equation is $d\sin(\theta)=m\lambda$, where d is the grating spacing, θ is the diffraction angle for the m -th order and λ is the wavelength.