

PREPARING OPTICAL FIBERS FOR MEASUREMENTS

and

MEASURING OPTICAL FIBER NUMERICAL APERTURE***PLEASE DO YOUR EXPERIMENT AND REPORT IN GROUPS OF TWO***

In this laboratory you will learn how to prepare an optical fiber for measurement. Then you will apply this skill to the measurement of the numerical aperture (NA) of a fiber.

- (1) For general background for this experiment, study pages 193-201 of Hecht.
- (2) Read sections 1.1, 1.2, 1.5, and 1.6.1 of the fiber optics manual to learn how to prepare fibers. The parts list on p. 28 is appropriate except that we will use a professional cleaver instead of the F-CL1 and we will use the optical table instead of the breadboard. Each group can borrow a laboratory manual to refer to as needed to finish your laboratory report. This must be returned in time for the laboratory next week.
- (3) Using a 50-meter reel (*not* the 500-meter reel) of graded-index, multimode optical fiber, measure out a length of 2 meters of fiber. [The 500-meter reel is used only for attenuation experiments.]
- (4) Prepare each end of the fiber by removing the coating (about 3.5 inches or 9 cm should be enough). Methylene chloride is toxic and can be absorbed through the skin. Any methylene chloride which gets on your skin should be immediately washed off.

After removing the coating, observe each end of the fiber in the microscope. Make a sketch of one of the ends showing that the coating has been removed, but that the end still needs cleaving.

The cleaver won't work unless you have removed the fiber coating. Cleave each end of the fiber. The cleaver to be used is the F-BK2 cleaver mentioned in the manual (or equivalent). Make a sketch of one end after cleaving. Note that cleaving is important to obtain efficient transmission of light into and out of the fiber during your experiment.

(11) Finally, go back and do section 1.6.1 (part 5). Sketch what you see and give a brief description.

Laboratory 5 Name (1)_____ Name (2)_____ Date _____

REPORT

For your report you should include the items listed below.

1. Sketch of a fiber end showing coating removed.
2. Sketch of a fiber end after cleaving.
3. Available laser optical power.
4. Maximum output power measured at the end of the fiber by the detector.
5. The NA determined by your measurements at the detector end of the fiber.
6. Your plot of the measurements taken using the rotation stage at the laser end of the fiber and the corresponding NA determined by these measurements. Attach the plot to this section.

10 Report the results of your incandescent lamp observation of the fiber.

11. Based on the measurements, would it be possible to obtain a good estimate of the attenuation of your fiber in dB per meter? Why or why not?

12. Discuss any problems you had in doing the experiment.