Lab Report 1 Template – Numerical Aperture

This report should be a written report, do not just write down the answers. Length does not matter—the shorter, the better. Just make sure you answer all of the questions. The theory needed can be found in *Lab0: Primer in Fiber* Optics (the Project 0.pdf).

Abstract (1 pt)

A description of the objective of the lab.

Introduction (2 pts)

A brief discussion on the different parts of the fiber (There are 3 layers. Which layers are higher index, which are lower? Which layers guide the light?) What are they made out of? (The fiber we used is F-MLD from Newport).

Why are we interested in the numerical aperture? What does it tell us about the limitations of how we can couple light into the fiber

Experiment (6 pts)

Plot the data as normalized power vs. $\sin\theta$ (the same way as in the project1 guide on the website). This will require changing the experimentally measured degrees such that the max power is at 0 degrees.

Calculate the experimentally measured numerical aperture. This is the point at which the power drops to 5% of the maximum. Mark this on your graph. Is the measured curve symmetric?

How does our measurement compare to the manufacture specification of 0.3?

Assuming that we did a perfect job of cleaving the fiber and aligning it so that we can put 100% faith in our experiment, and assuming the $n_{core} = 1.46$. Calculate $n_{cladding}$ to match our experimentally measured numerical aperture? Show all of your steps.

List 2 possible sources of error in the experiment.

Conclusion (1 pt)

Conclude and summarize the findings.