Lab Report 3 Template – Single Mode Fiber I

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 *Lab3: Single-Mode Fiber I* (Project 3_0.pdf).

Abstract (1 pt)

A description of the objective of the lab.

Introduction (2 pts)

What is their defining physical difference between a single mode and a multi-mode fiber? What is the V-number of the fiber (Newport F-SV) at the the HeNe wavelength (633nm)? What is the cutoff wavelength of this fiber?

Experiment (6 pts)

Sketch the experimental setup. Label: HeNe laser, objective, fiber coupler, fiber, rotation mount, power meter, d_0, d and d_1. (The variables are taken from the lab instructions. Must label all those that a mentioned to get the point) **(1pt)**

Assuming the fiber has a *diameter* of 4µm calculate the spot *diameter* of the mode within the fiber defined by the $1/e^2$ cutoff points. **(1pt)**

In order to maximize the coupling of the light into the fiber, the beam should be focused down to the spot diameter of the mode within the fiber. This can be accomplished by changing the position of the laser so the divergence is such that when focused through the objective the focused spot diameter matches the mode diameter in the fiber. Taking all of this into consideration, calculate *d*. Assuming the divergence of the HeNe is 1.4mrad calculate the necessary distance between HeNe and objective. **(2pts)**

Plot the experimental results, θ vs *Normalized* power. **(1pt)**

Mark the $1/e^2$ points on the plot. Then Plot the Gaussian curve over the data. How do the two compare? **(2pts)**

Conclusion (1 pt)

Conclude and summarize the findings.