
OPTI 380A—LAB#2

Semiconductor Light Sources II: Manipulation of Beam Geometry and Optical Spectrum Characterization

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(1) Use a lens to collimate the beam.
Use a lens with a larger NA then the NA of the diverging laser beam.

(A) How does the NA affect the amount of power in the collimated beam? What happens if the NA of the lens is smaller than the NA of the diverging laser beam?

{NEC NDL3220 laser diode, 5.6mm dia., 670nm, 5mW max.}
{Laser Diode Driver, THORLABS LT230A Collimation Tube, Aspheric collimating lens, FL=4.5mm}

(2) Measure the output power in the collimated beam.

(B) Compare this to the power you measured for the uncollimated beam in last week's lab.

(C) What is the transmission of the collimating lens?

{NEC NDL3220 laser diode, Laser diode driver, calibrated "absolute" detector}

(3) Measure the polarization ratio $P_{\parallel}/P_{\perp}$ **of the collimated beam.**

(D) Report your data and this ratio.

{NEC NDL3220 laser diode, Laser diode driver, Trans-impedance amplifier ("TIA"), DC voltmeter, linear polarizer}

(4) Use an anamorphic prism pair to circularize the collimated beam.

(E) What is the magnification of the prism pair needed to circularize the beam?

(F) Explain the concept of "magnification" as it relates to a prism.

(G) Describe the procedure you used to circularize the beam.

{NEC NDL3220 laser diode, Laser diode driver, THORLABS LT230A collimation tube, Aspheric collimating lens, FL=4.5mm, THORLABS PS871-b Anamorphic Prism Pair, coated 650-1050nm}

(5) Measure the output spectrum of the diode laser as a function of drive current.
Learn how to use the optical spectrum analyzer (OSA).

******* NOTE: Use the optical fiber cable to couple a small amount of laser light into the OSA. Observe the warning label at the input to the OSA!***

(H) What is the maximum power, in watts, that the OSA can handle before turning into a $100,000 piece of optical junk?

Use the OSA to measure the output spectrum of the diode laser, for drive currents below, at, and above threshold. This can be done at room temperature. Print out the spectra if it is connected to a printer. If not, transfer the data and print from pc.

(I) How does the output spectrum change as a function of drive current? What does the spectrum look like below, at, and above threshold?

(J) Calculate the cavity length, L, based on the measured mode-spacing.

(6) Mode-hopping above threshold.

Using the same setup as for part (5), measure the output spectrum as you vary the drive current well above threshold (STAY BELOW THE MAXIMUM CURRENT….DON'T BURN OUT THE LASER.)

(K) How does the spectrum change as a function of current? Do you observe mode hopping?