
OPTI 380A—LAB#1
Semiconductor Light Sources I: Basic Properties

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(1) **Look at the laser diode and built-in photodiode, under the microscope.**

(A) Make a drawing of what you see.

(B) Use the reticle to estimate the laser cavity dimensions (HxWxL).

(C) Calculate the frequency separation of the longitudinal modes. Is it c/2L or c/2nL?

{NEC NDL3220 laser diode, 5.6mm dia., 670nm, 5mW max.}
{microscope, camera}

(2) **Measure LI curves, using the built-in photodiode.**

(D) Graph your data.

(E) Calculate I_t, the threshold current, from the data.

{NEC NDL3220 laser diode, Laser diode driver (current source),
Trans-impedance amplifier (« TIA »), DC voltmeter}

(3) Measure the output power using a power meter.

(F) Calculate the slope efficiency

from your data.

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

(4) Measure the beam divergence in both $\parallel$ and $\perp$ directions.
This will require 4 different measurements of the beam diameter.

(G) Report your data and calculations.

(H) How do the beam divergences relate to the orientation of the output face of the p-n junction? Explain.

(I) Assuming the beam is diffraction-limited, what are the effective dimensions of the output face of the laser? How do these numbers compare to what you measured directly using the microscope?

{NEC NDL3220 laser diode, Laser diode driver, Trans-impedance amplifier (“TIA”), DC voltmeter, CCD camera, NIH software used to measure a line profile across the irradiance pattern of the beam}

(5) Measure the polarization ratio $P_{\parallel}/P_{\perp}$ **.**

(J) Report your data and this ratio.

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

(6) Measure the relative radiance between the LED and the LD.

(K) Report your data and this ratio.

{NEC NDL3220 laser diode, Laser diode driver, Trans-impedance amplifier (“TIA”), DC voltmeter, pinhole, and LED}