7. Experiments

The semiconductor laser used in the experiments is a visible semiconductor laser with a central wavelength of 650 nm and a maximum power output of 5 mW.

7.1 Output characteristic of semiconductor laser

The experimental configuration is shown in Figure 5. Fix the laser head into the circular laser fixture and mount them onto the 2-D adjustable holder. Mount the photodetector of the light power meter onto the carrier. Use the current indicator of the laser driver to monitor the value of injection current to the laser; use the collimating lens (inside the laser head) of the laser to couple laser light to the detection head of the optical power meter; increase the injection current gradually from zero to 23 mA (note: current limit was preset at ~ 23 mA at factory for the laser driver) while monitoring the power output of the laser on the optical power meter. Repeat the measurements twice and plot the obtained *P-I* curve.

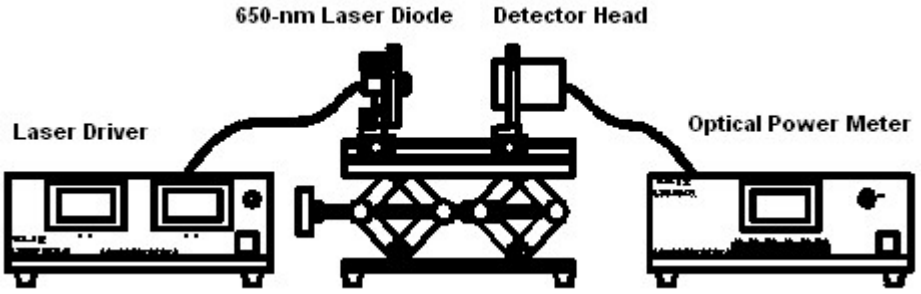

Figure 5 P-I curve measurement of semiconductor laser

7.2 Divergent angle measurement of semiconductor laser

Mount the laser head into the square laser fixture. As shown in Figure 6, place the laser (with fixture) at the center of the rotary stage and remove the collimating lens from the laser head so that the output laser beam is divergent. At a fixed injection current, rotate the rotary stage while monitoring the laser output power on the power meter at various rotation angles. Change the injection current and repeat the above measurements. Plot the curve of output power versus rotation angle under various injection current values. Rotate the laser by 90° and then repeat the above measurement to obtain the divergent angle of the side-view transverse field of the laser.

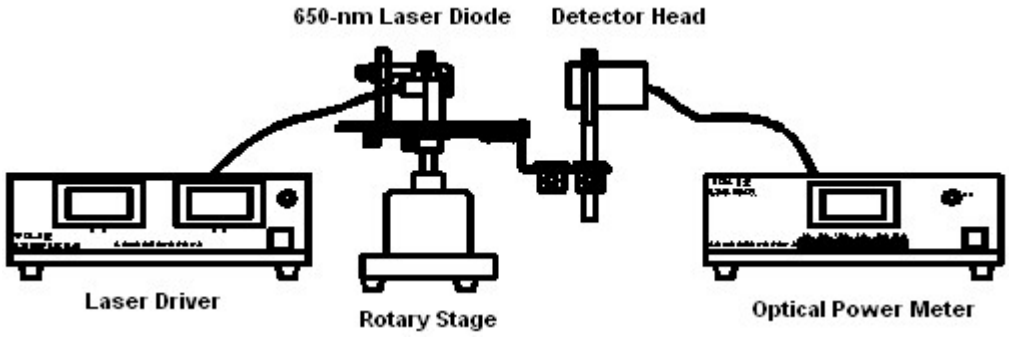

Figure 6 Divergent angle measurement of semiconductor laser

7.3 Degree of polarization measurement of semiconductor laser

The experimental configuration is shown in Figure 7. Rotate the polarizer while monitoring the optical power of the laser transmitted through the polarizer. Record the maximum and minimum optical power of the laser while rotating the polarizer. Use equation (3) to calculate the degree of polarization of the laser.

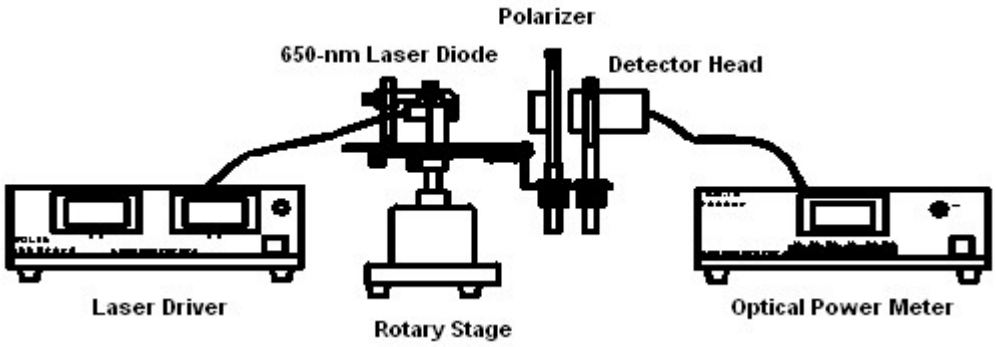

Figure 7 Degree of polarization measurement of a semiconductor laser

7.4 Spectral characteristic measurement of semiconductor laser

Note: please read the instruction manual of LEOI-100 CCD spectrometer first.

As shown in Figure 8, the collimated laser beam from the semiconductor laser is focused at the entrance slit of a CCD spectrometer through a lens (*f*=15 mm, dia=14 mm). Connect the CCD spectrometer with a PC via USB and measure the output spectral curve of the laser with the software provided. By changing the injection current of the laser, observe the peak wavelength shift of the output beam.

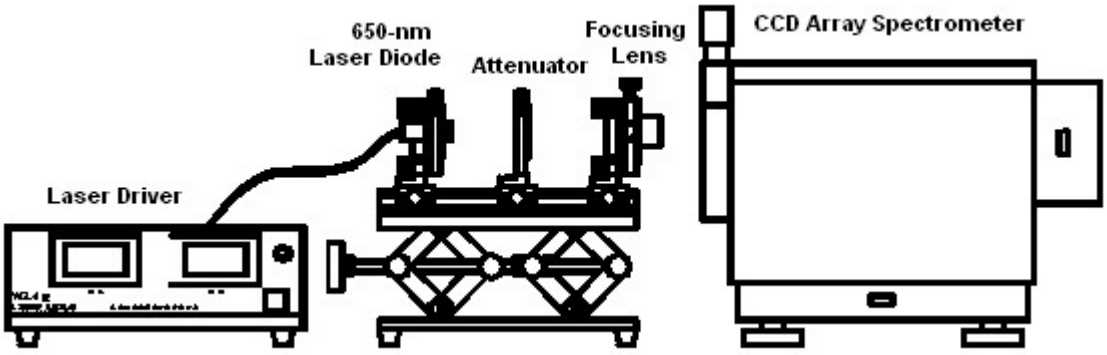

Figure 8 Spectral characteristic measurement of a semiconductor laser