Part 1

After completing this lab, students have to be able to calculate open circuit voltage, short circuit current and maximum power for different pads.

Part2

External quantum efficiency and Photocurrent calculations

The typical response of the photodiode (Responsivity: R (λ)) was provided in the photodiode specification information. The intensity of the monochromator (I (λ)) is obtained by calculating:

$$I(\lambda) = \frac{i(\lambda)}{R(\lambda)}$$

The intensity was calculated at 5 nm increments, but cell measurements were usually taken at either 10 nm or 20 nm increments.

The energy of the incident photons was calculated from:

$$E_{photon} = \frac{hc}{\lambda_{photon}}$$

Here, *h* is Planck's constant, c is the speed of light and λ is the wavelength of the incident photon. This information was used along with the I (λ) to calculate the number of incident photons per second:

$$\text{Number of Photons } (\lambda)/\text{ second} = I(\lambda)/ E_{photon}(\lambda)$$

The processing involved correcting for resistance and the gain that was applied to obtain the photocurrent:

$$\text{Photocurrent (A)} = \frac{\text{EG\&G voltage reading x } 50\ \Omega}{\text{Applied Gain}}$$

Then the number of electrons generated per second was calculated:

$$\text{Electrons/ second} = \frac{\text{Photocurrent}}{e^{-}}$$

where e^{-} is the charge of an electron. From this, the external quantum efficiency was calculated:

$$\text{Quantum Efficiency (\%)} = \frac{\text{Collected electrons}}{\text{Incident photons}} = \frac{\text{Electrons/ second}}{\text{Photons/ second}} \times 100$$

External quantum efficiency vs. wavelength was then plotted for different pads with photocurrent measurements.