

Computer Assisted Experiments with LASER Diode

By: Arslan Anjum

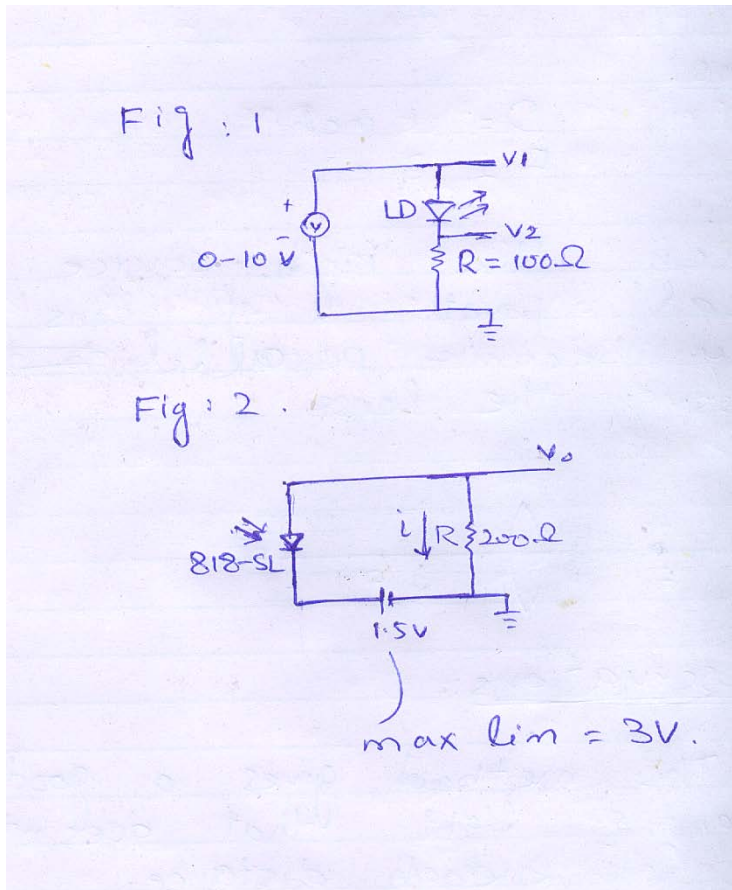
Outline

- 1) Radiant output power
- 2) Spontaneous emission threshold and h/e value
- 3) Stimulated emission threshold
- 4) Polarization of output light
- 5) Modulation characteristics



Radiant output power and efficiency

○ Circuit Diagram

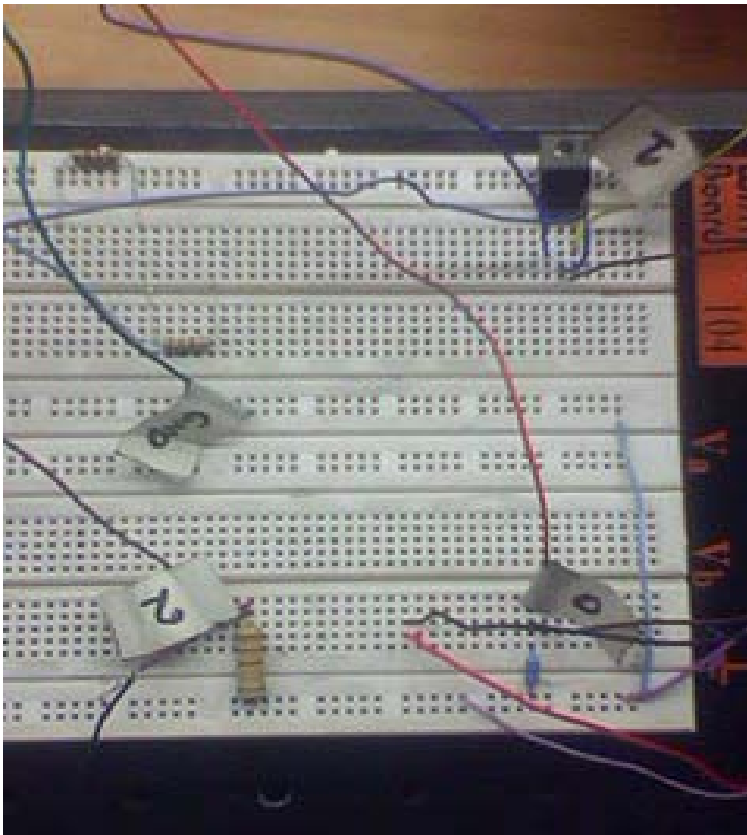


○ Setup

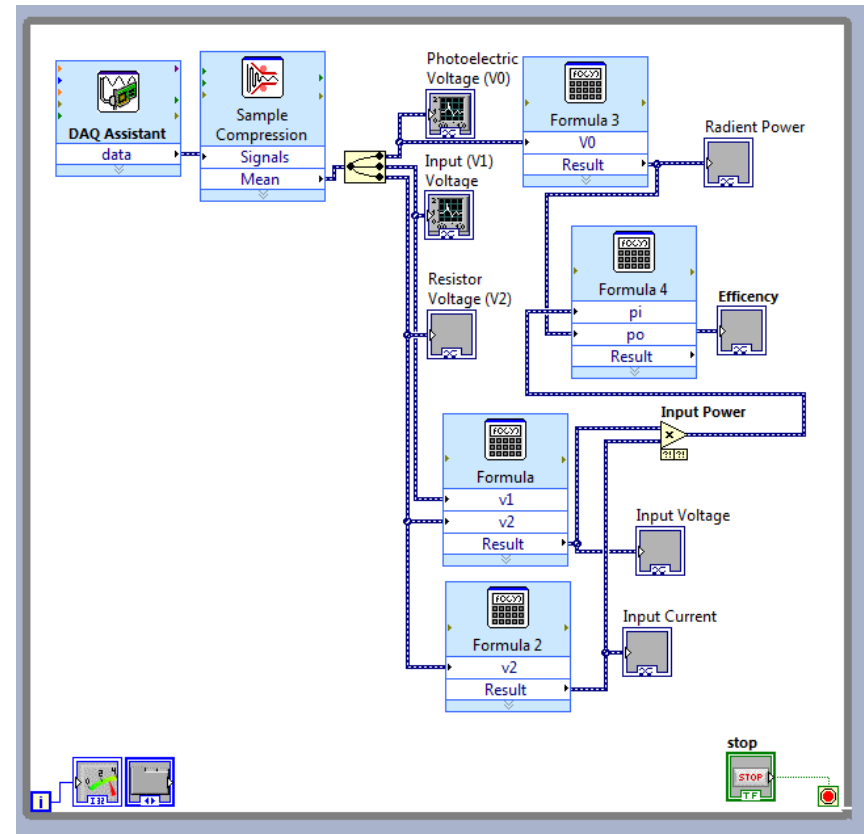


Radiant output power and efficiency

○ Connections



○ LabView VI

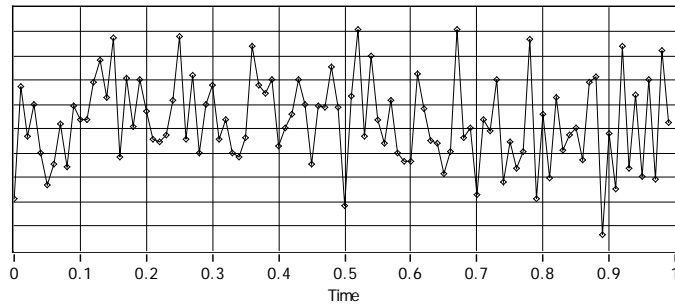


Radiant output power and efficiency

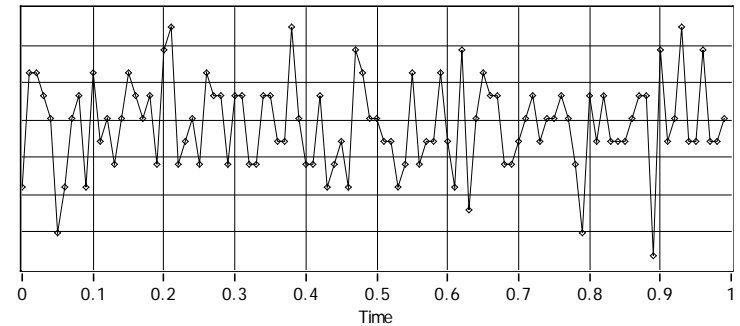


○ Real Time Measurements

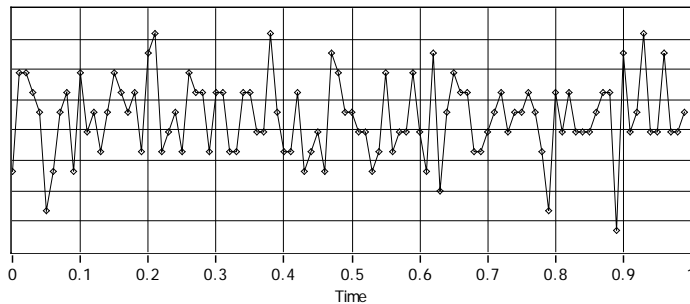
Input Power (W)



Efficiency



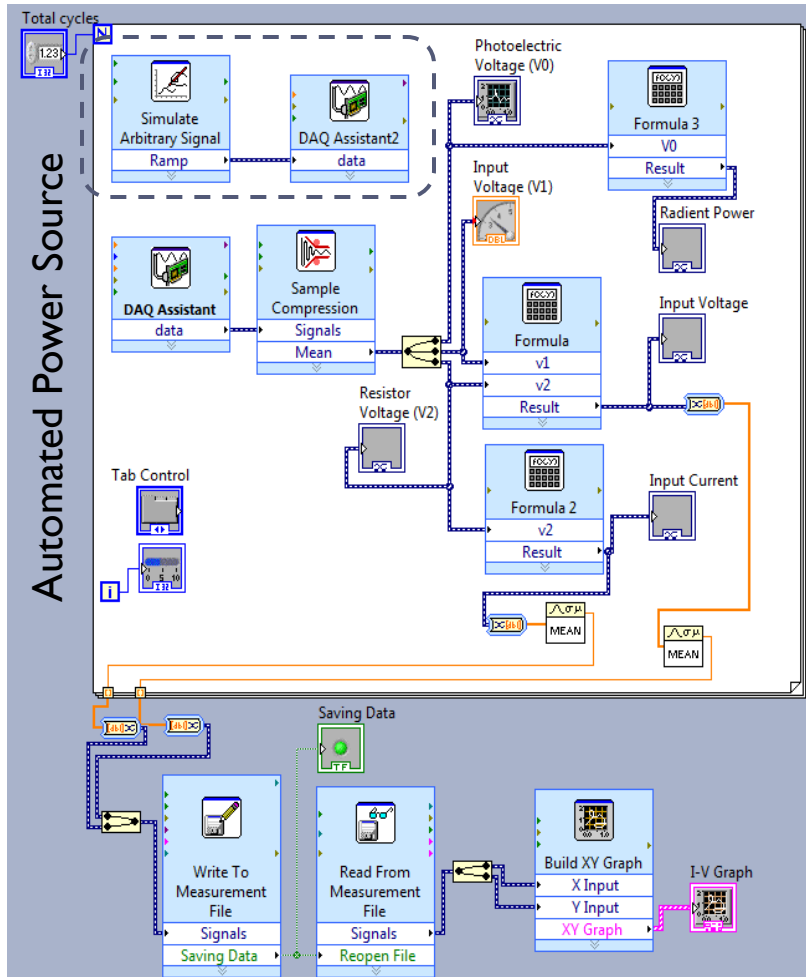
Output Power (W)



Spontaneous emission and h/e ratio

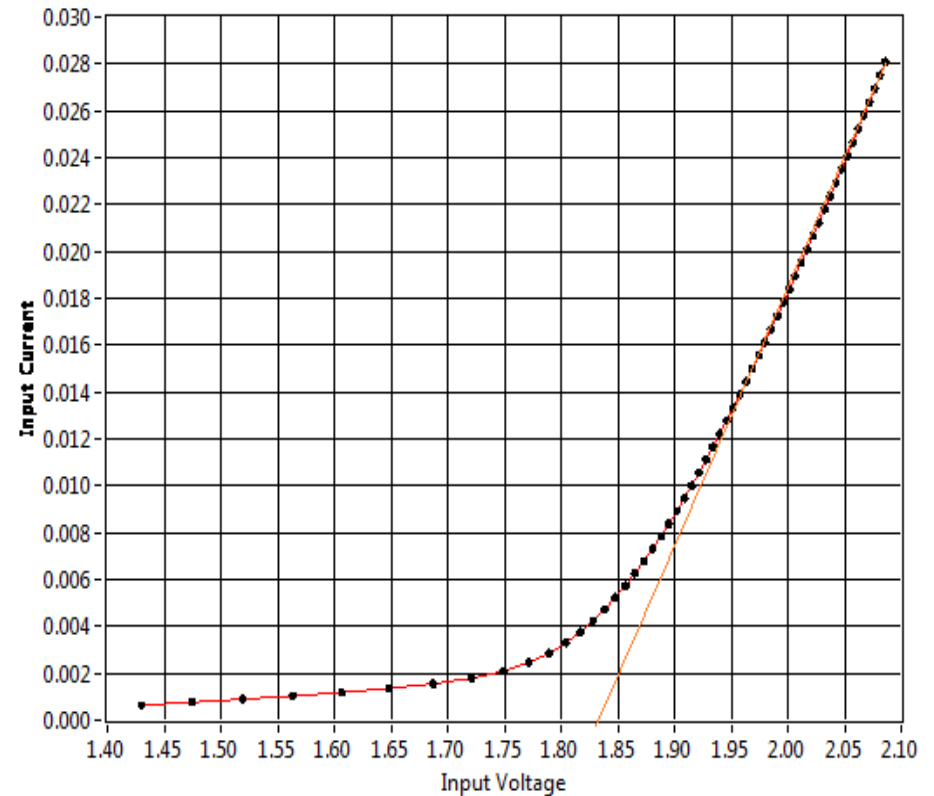


○ LabView VI



○ Input Current

I-V Graph



Spontaneous emission and h/e ratio



○ Calculation

$$E = hc/\lambda$$

and

$$E = eV_{th}$$

so

$$h/e = \lambda V_{th}/c$$

$$V_{th} = 1.83 \pm .03 \text{ V}$$

$$\lambda = 657.47 \pm .01 \text{ nm}$$

so

$$h/e = 4.01 \times 10^{-15} \text{ Js/C}$$

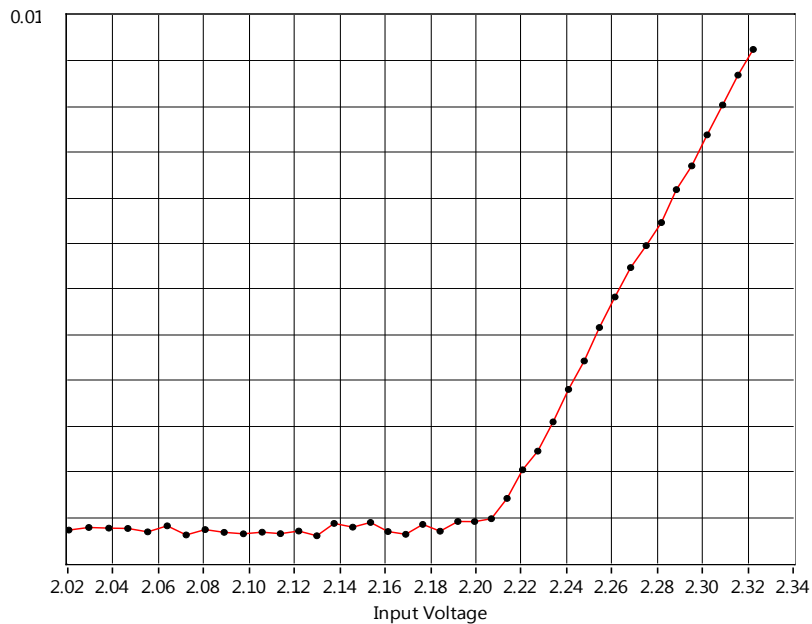


Stimulated emission and Lasing threshold



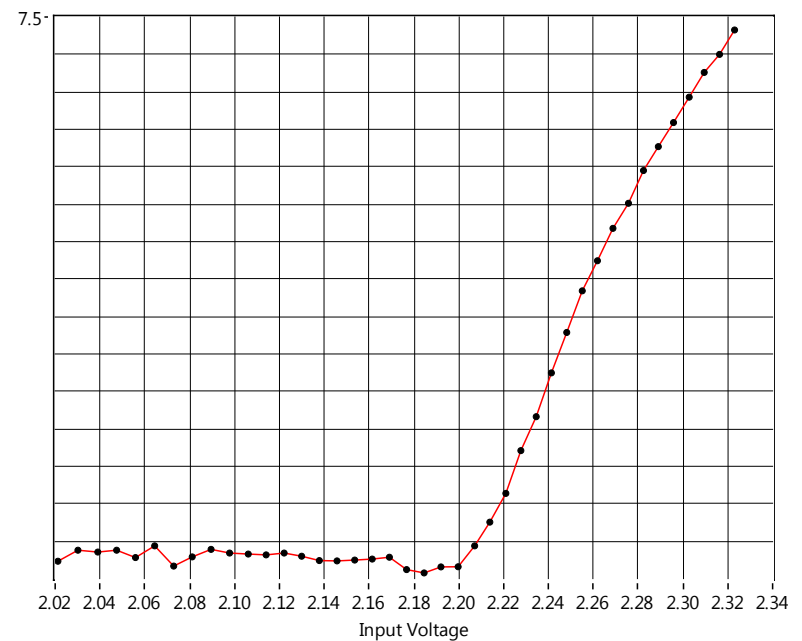
○ Output Power

Radiant Power-Input V



○ Efficiency

E-V Graph



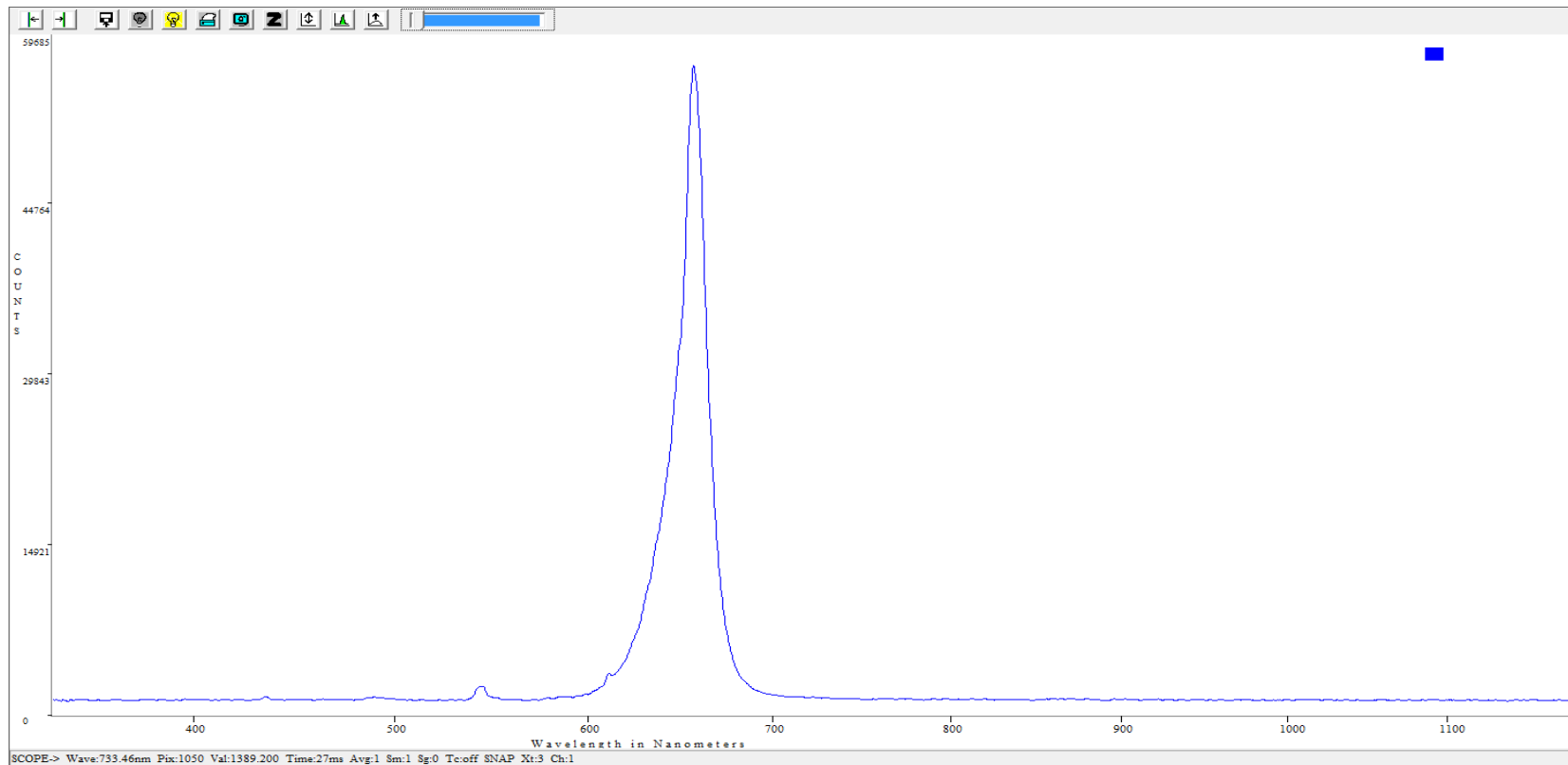
$$V_{th} = 2.19 \pm 0.1 V$$



Stimulated emission and Spectrum change



○ Before V_{th}

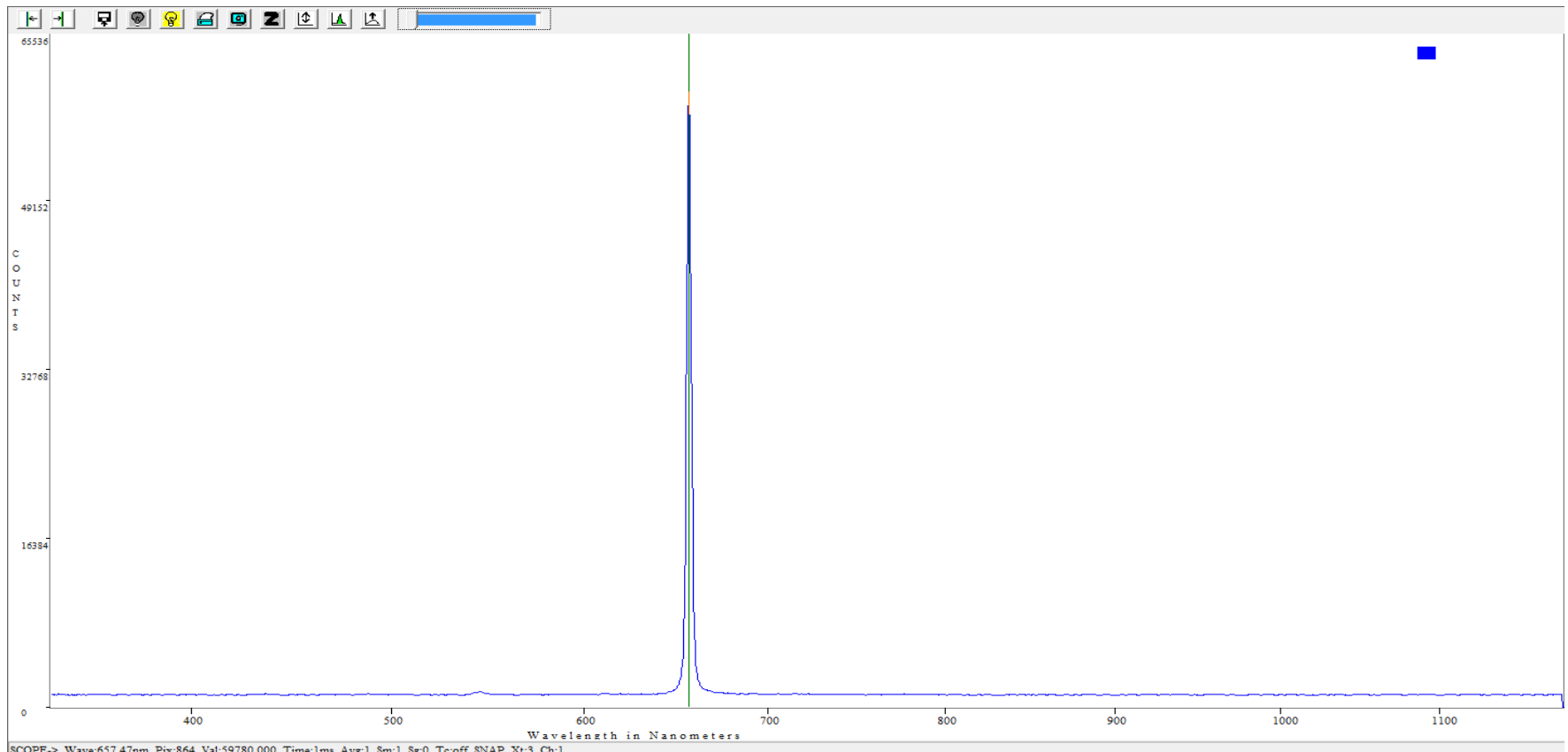


Stimulated emission and Spectrum change



○ After V_{th}

$$\lambda_{max} = 657.47 \pm .01 \text{ nm}$$

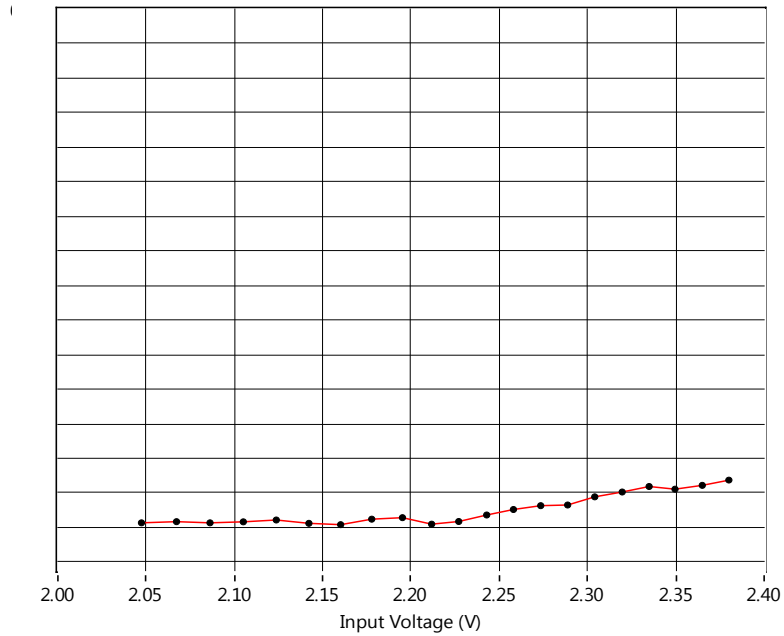


Polarization of output light



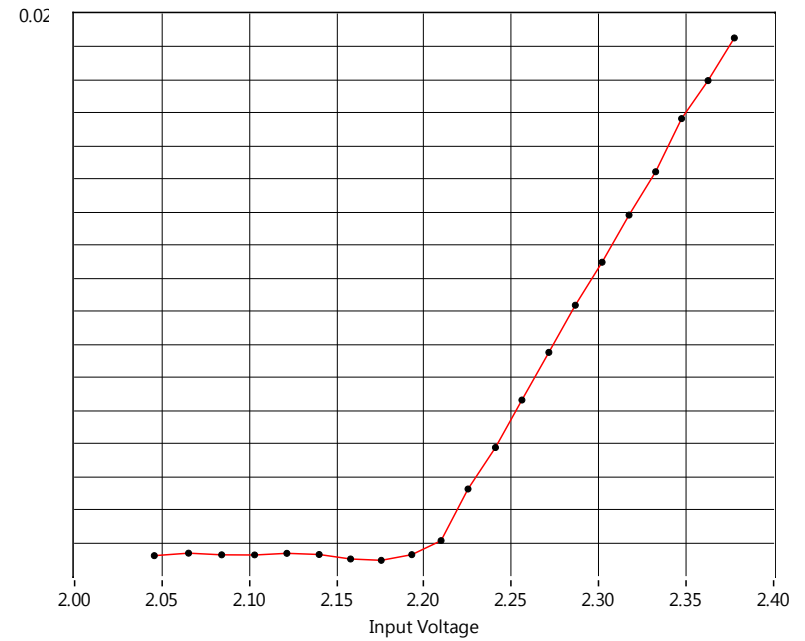
I_{\min}

Radiant P- V



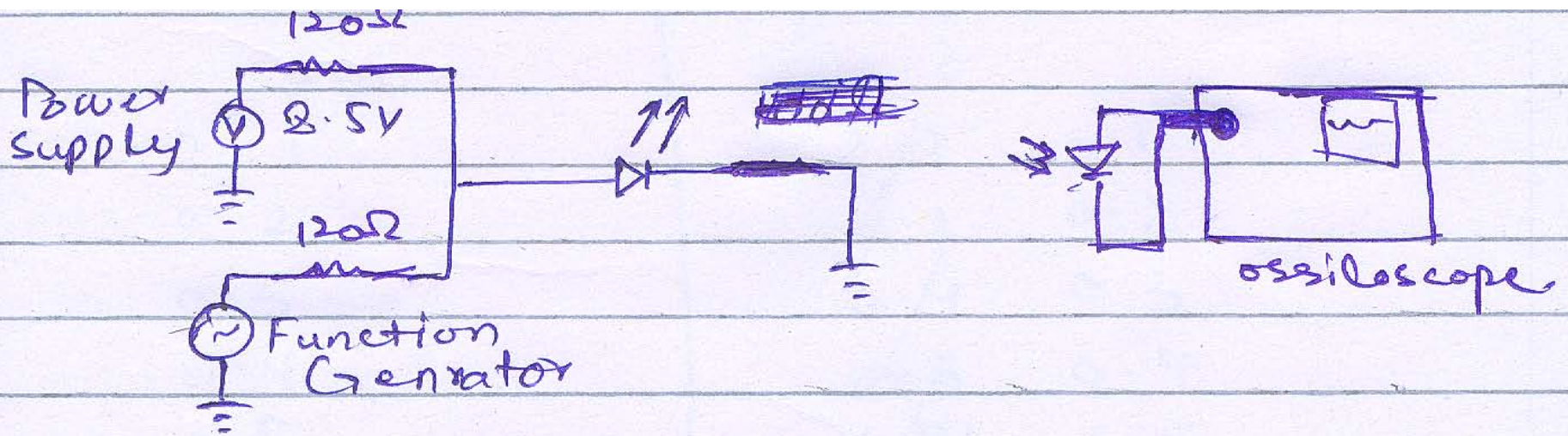
I_{\max}

Radiant P- V



Modulation characteristics

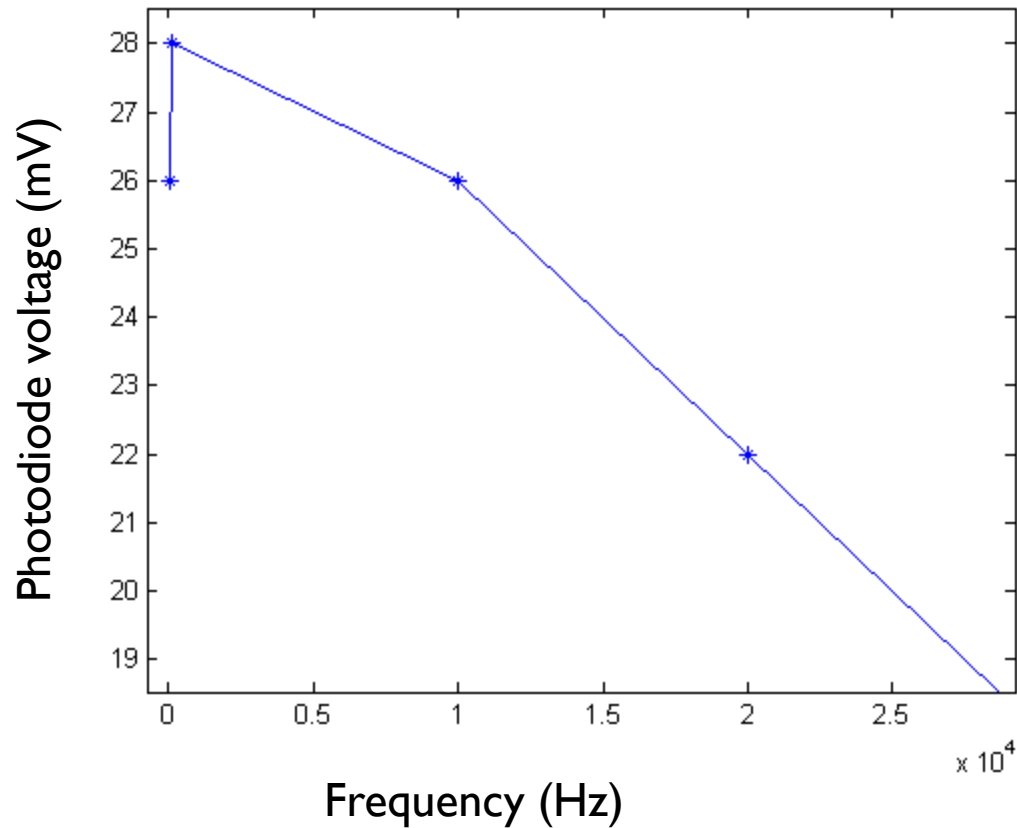
o Circuit Diagram



Modulation characteristics

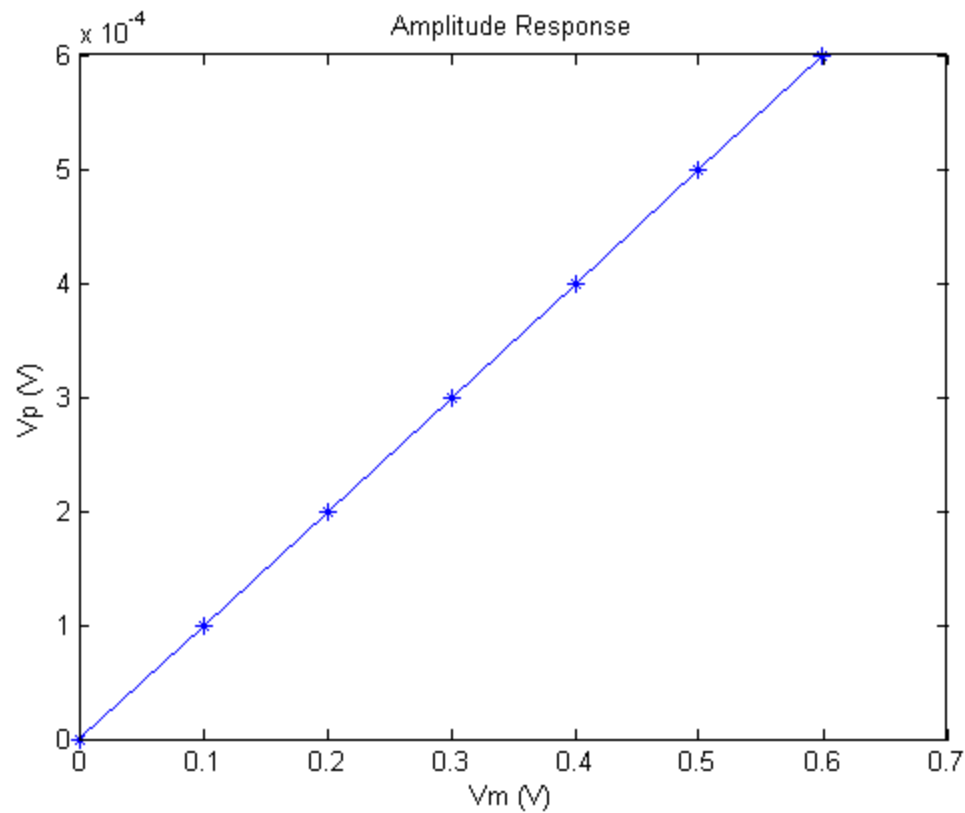


- Frequency response



Modulation characteristics

○ Amplitude response



The End
...Questions...

