Photonics Lab:

questions: 1 - LI plot, L using Voltage? 2 - responsivity method 3-value of bode plot

**Question 1**

**Enter the value of the resistor you used in series with the LED in the transmitter circuit (enter the value in ohms).**

Answer: 115 ohm

**Question 2**

**Upload a single figure showing the VI plots for both the LED and laser.**



**Question 3**

**Upload a single figure showing the LI plots for both the LED and laser.**



**Question 4**

**Enter the value you found for the threshold current of the laser (enter the value in mA).**

Answer: 18 mA

**Question 5**

**You have measured the LI plots in terms of the photocurrent generated by the photodiode. In order to calculate the optical power reaching the photodiode, you need to know the responsivity of the photodiode (i.e. how much photocurrent is generated for each unit of optical power incident on the photodiode).**

**The responsivity of the photodiode is not given directly in the datasheet, but enough information is given to allow you to estimate it (you need to find several pieces of information and combine them).**

**Using the information on the photodiode datasheet, calculate the the responsivity of the photodiode at the wavelength of the laser diode. Enter your answer in units corresponding to A.W-1.**

A picture containing text, device

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By these graphs, when wavelength = 650 nm (laser 655nm), the relative spectral sensitivity is around 0.67. And the max sensitivity is at wavelength = 920 nm.

From fig4, gradient, (1, 40), (0.01, 0.4)

Table

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对于这个photodiode, irradiance = 1 时，功率W = A \* 1mW/cm2 = 1 \* 10-3 \* 7.5 \* 10-2 = 7.5 \* 10-5 (W).

irradiance = 0.01时，功率W = 7.5 \* 10-7 W.

**Question 6**

**Enter the DC offset (Ibias) you set on the signal generator when making the frequency response measurements in Task 3. Enter the value in volts (V).**

offset = 5.7 V

**Question7**

**Enter the a.c. peak-peak drive you set on the signal generator when making the frequency response measurements in Task 3. Enter the value in volts (V).**

Vpp = 0.6 V

**Question 8**

**Upload a single figure showing the frequency response plot for the photonic system using the laser as the transmitter.**

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**Quesiton 9**

**What is the -3-dB bandwidth of your system's frequency response? Enter the value in kHz.**

37 kHz

**Question 10**

**The bandwidth of the system should be limited by the RC time constant of the receiver circuit.**

**From the datasheet, find the capacitance of the photodiode when the reverse bias is 5 V.**

**Calculate the expected -3-dB bandwidth of the receiver (assuming it is RC limited). Enter the value in kHz.**

39.8 kHz

**Question 11**

**Upload a single figure showing scope captures of the receiver voltage when the laser is driven with a square wave (at 2 or 3 different frequencies). Ensure the frequency used for each scope capture is clearly shown.**

**Question 12**

**Enter the value of the fibre loss you measured, giving your answer in dB.m-1.**

Task 4:

without long fibre: V = 232.26-50.47

with long fibre: V = 70-17.15

db drop = - 10.73

db per meter = -1.07

**Question13**

**Briefly describe the method you used to measure the loss of the fibre, including explaining how you obtained the loss in dB.**

With the same input signal of frequency = 1kHz, Vpp = 600mV and offset = 5.7 V, Irecorded the output response of the system with and without the long fibre.

From the oscilloscope, we got the output Vpp without long fibre is 181.79 mV, while that with the long fibre is 52.85 mV.

Thus, the gain of this system without long fibre is 20\*log10(181.79/600) = -10.37 dB, and the gain of the system with long fibre is 20\*log10(52.85/600) = -21.10 dB.

So the total loss of the long fibre is (-21.10) - (-10.37) = -10.73 dB, and then the loss per meter = (-10.73) / 10 = -1.073 dB/m.

**A screenshot of a computer

Description automatically generated with medium confidence Graphical user interface, diagram

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Figure 1. without capacitor Figure2. with 200pF capacitor

**Frequency : 1 kHz**

**Graphical user interface, diagram

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**Frequency : 14 kHz**

**Graphical user interface

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**Frequency : 50 kHz**

**Graphical user interface, chart

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