Experimental Procedure Milk lab set-up

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Introduction

For this specific experiment you are going to be placing drops of milk into a watered sample cuvette to find the number of photons coming through each face using a photo-detector. The given photo detector should have an R_f value of roughly 5798Ω, with an R value of $\approx .35A/W$ which is the photosensitivity. Your goal for this lab is to demonstrate the change of intensity as a ratio between forward scattering left scattering and right scattering. (Top scattering will be ignored unless you have absorbent material on the top your work table.) You will also be finding the number of photons hitting the photo-detector based on the reading from your voltmeter. For this lab you will be using a 650nm >1mW laser.

1 Theory

In the context of theory there is a lot to discuss, for this specific lab you will not need to know too much in the context of heavy mathematics. However for the second part of the lab calculating the number of photons for the experiment will rely on energy derivation. So first know that in the context of the photo detector we have

$$\frac{Nhc}{\lambda} = \frac{V}{RR_f}$$

Where N is the number of photons, and V is the recorded voltage. From there solve for N

$$N = \frac{V\lambda}{hcRR_f}$$

from there you can solve for the number of photons emitting from each face of the cuvette every x-seconds.

2 Procedure

- Gather everything you need, a ruler, a power supply, a photo diode, voltmeter, cuvette, one cup of milk, 2 pipettes, 1 650nm laser, and a square if possible.
- First step is to connect the photo diode to the power supply via the coaxial adapters(on the in section of the diode), from there plug in the cables to the power supply.
- Now connect the voltmeter to the photodiode through the same adapter and turn on the power supply(you should get a visible read of the room radiation)(around 1mv).
- From there turn out the lights and record the intensity of the laser interms of voltage from the photodetector. make sure the photodetector is as aligned with the photodetector as possible.
- From there place the cuvette at a height such that the laser is 32mm from the base of the cuvette and is perfectly center to the cuvette.
- once the cuvette is aligned and squared with the laser such that the laser is perpendicular to the surface of the cuvette record the intensity of the laser again after introducing the cuvette(should be slightly lower)

- After you have aligned the cuvette fill the cuvette with water, then record the intensity of the laser again.
- Once that is done, drop a singular drop into the cuvette and swirl the cuvette with a stick(coffee stick or toothpick preferably) until the distribution is course.
- Once you have swirled the milk and let it sit for a moment, then turn out the lights and begin recording the voltages for the front,left, and right faces of the cuvette. Make sure to get the detector as close to the cuvette as possible or maintain a consistent distance from cuvette to ensure proper data collection.
- Afterwords drop another drop into the cuvette and repeat
- Repeat until at the very least 6 drops are collected.
- from there calculate the distribution of intensities as percentage as well as the number of photons from each face of the milk.

■ General ratings / Absolute maximum ratings

Type No.	Dimensional outline/ Window material *1	Package	Active area size	Effective active area	Absolute maximum ratings			
					Reverse voltage V_R Max.	Power dissipation P	Operating temperature Topr	Storage temperature Tstg
		(mm)	(mm)	(mm^2)	(V)	(mW)	(°C)	(°C)
S1722-02	①/Q	TO-8	ϕ4.1	13.2	120	50	-20 to +60	-55 to +80
S1723-05	②/Q	Ceramic	10 × 10	100	50	100		-20 to +80

■ Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type No.	Spectral response range λ	Peak sensitivity wavelength λp	Photo sensitivity S (A/W)		Dark current I_D Max. (nA)	Temp. coefficient of I_D T_{CID}	Cut-off frequency fc	Terminal capacitance Ct	NEP
			λp	He-Ne Laser 633 nm					
	(nm)	(nm)				(times/°C)	(MHz)	(pF)	($W/Hz^{1/2}$)
S1722-02	190 to 1100	960	0.5	0.33	30 *2	1.15	60 *2	10 *2	1.1×10^{-14} *2
S1723-05					10 *3		15 *3	100 *3	2.3×10^{-14} *3

Figure 1: Photo-diode Information

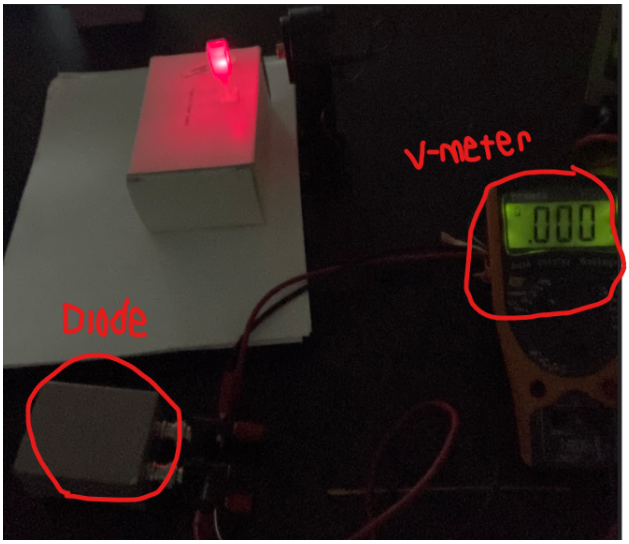

Figure 2: Experimental set up(red glowly thing is cuvette)

3 Figures and Sample Graphs

4 Saftey Precautions

- don't turn up the voltage too high on the power supply
- Do not spill the milk or drink it
- Do not stare into the laser.