**SDE**

**LabVIEW**

# Purpose

The purpose of this experiment is to examine the diffraction pattern produced by a double slit placed in the path of a laser. As well I will investigate the angular relation with intensity peaks

# Theory

A gap in the path of plane waves becomes a Huygens source. Huygens source is characterized by waves spreading out in all directions. A Laser light source may be considered a plane wave. When this source encounters two such gaps with a minimal distance between them, a distance on the order of their wavelength, the two Huygens sources display the phenomenon of diffraction. One common occurrence is considering diffraction as the same as interference. Diffraction is not interference. Interference is when two waves from different sources interact. In this experiment we consider two Huygens sources a distance d apart. We label, x, the distance until both wavelength being to interfering according to our perspective. For constructive interference:

x= λn and nλ = dsinθ, where λ is the wavelength 623.8nm. While for destructive interference x = λ/2, (2n-1)\*λ/2 = d sinθ. Upon interfering a central bright fringe is formed as well as other decreasingly less intense fringes. We label y as the distance between the central bright fringe to the center and the next corresponding fringe. Respectively y/d = sinθ.

# Apparatus and Procedure

I collected data with a phototransistor placed on top of a stepper motor. To view the data and control the rate of data acquisition I used LabVIEW. The procedure was as follows”

* Place slit in the path of a laser beam in order to produce a diffraction pattern on a screen a distance 1.55 meters away from the screen.
* Place the stepper motor on the right end of the patterns
* Run the LV program to record data.
* View the data in excel

Apparatus

2CDPI Planer diffused silicon photodiode

B2500 unislide Stepper motor

1339558 JDS Uniphase laser wavelength 623.8nm

PDA-700 Photodiode Amplifier

Single slit width 0.16mm, double slit width 0.04 double slit spacing 0.25

LabVIEW programing

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | 0.292 | 0.245 | -0.310 | -0.151 | 0.522 | 0.884 | 0.008 | 0.166 | | 0.283 | 0.252 | -0.302 | -0.144 | 0.535 | 0.897 | 0.015 | 0.174 | | 0.274 | 0.260 | -0.295 | -0.136 | 0.556 | 0.914 | 0.023 | 0.181 | | 0.264 | 0.269 | -0.287 | -0.129 | 0.576 | 0.926 | 0.030 | 0.189 | | 0.257 | 0.278 | -0.280 | -0.121 | 0.597 | 0.931 | 0.038 | 0.197 | | 0.253 | 0.286 | -0.272 | -0.113 | 0.613 | 0.944 | 0.045 | 0.204 | | 0.247 | 0.297 | -0.265 | -0.106 | 0.631 | 0.954 | 0.053 | 0.212 | | 0.241 | 0.307 | -0.257 | -0.098 | 0.647 | 0.961 | 0.060 | 0.219 | | 0.238 | 0.319 | -0.249 | -0.091 | 0.670 | 0.973 | 0.068 | 0.227 | | 0.234 | 0.333 | -0.242 | -0.083 | 0.686 | 0.979 | 0.076 | 0.234 | | 0.230 | 0.342 | -0.234 | -0.076 | 0.707 | 0.987 | 0.083 | 0.242 | | 0.228 | 0.355 | -0.227 | -0.068 | 0.723 | 0.988 | 0.091 | 0.249 | | 0.227 | 0.366 | -0.219 | -0.060 | 0.739 | 0.992 | 0.098 | 0.257 | | 0.225 | 0.380 | -0.212 | -0.053 | 0.760 | 0.995 | 0.106 | 0.265 | | 0.223 | 0.398 | -0.204 | -0.045 | 0.774 | 0.999 | 0.113 | 0.272 | | 0.224 | 0.413 | -0.197 | -0.038 | 0.791 | 0.999 | 0.121 | 0.280 | | 0.225 | 0.436 | -0.189 | -0.030 | 0.803 | 1.006 | 0.129 | 0.287 | | 0.226 | 0.448 | -0.181 | -0.023 | 0.830 | 1.001 | 0.136 | 0.295 | | 0.230 | 0.465 | -0.174 | -0.015 | 0.841 | 0.999 | 0.144 | 0.302 | | 0.235 | 0.485 | -0.166 | -0.008 | 0.861 | 0.996 | 0.151 | 0.310 | | 0.239 | 0.502 | -0.159 | 0.000 | 0.873 | 1.000 | 0.159 | 0.318 | |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Analysis The architectural design of the experiment worked very well in achieving the results. Because of the design rationale, the simplest option to observe a diffraction pattern was designed. Interface of the system is quite simple and functional. Upon running the program the Daq Assistant collects the various various increases in current due to the amplification of the photodiode amplifier, this values are recorded and observed at the same time the stepper motor relocates the position. |  |