

Diffraction – Variable Slit

Equipment

- Microwave apparatus
 - Consult *LD Physics Leaflet P3.7.4.3* “Interference of microwaves”

Objectives

- Experimental
 - Design and construction of wave experiment
 - Use of microwave equipment.
- Data Analysis
 - Modeling theoretical diffraction curve (sinc function)
 - Error propagation, random and systematic errors

Introduction

Diffraction is a wave phenomenon that can be observed with light, sound and even matter. Using different electromagnetic wavelengths allows you to explore wave phenomena using macroscopic objects.

Pre-lab Queries

- What happens to the diffraction pattern from a single slit as the slit narrows?
- What is the range of expected photon energies and wavelengths for microwaves?
- Discuss the difference between a traveling wave and a standing wave.
- What is a klystron?

Basic Lab

Setup the microwave apparatus to produce a standing wave.

- Measure the location of the nodes and antinodes to determine the wavelength.

Setup the microwave apparatus to produce a diffraction pattern from a single slit.

- Determine the diffraction pattern for the slit as its width is varied.

Advanced Lab

- Compare the theoretical to the measured diffraction pattern as you vary the slit width.
- Measure the diffraction pattern behind a small obstruction (Poisson’s spot)

References

- Consult *LD Physics Leaflet P3.7.4.3* “Interference of microwaves”
- *Leybold Didactic Instruction Sheet 737-020* “Gunn Power Supply with Amplifier”