

Phys 4910 Spectroscopy

The Fabry Perot Etalon

Introduction

The Fabry Perot etalon is a multi interference device which relies on the same multi beam interference model that we used to describe the diffraction grating. However, it uses a different physical arrangement and so the definition of the phase difference between beams is different.

A description of the etalon is to be found in any text on optics, and on line. Since other students have not seen the etalon in class a substantial portion of your presentation should include a description of the device and

- its resolution (look under finesse)
- that the pattern is a series of circles, with r^2 proportional to the order number.

Spectra

The etalon is always used to measure small differences in wavelength, and usually cannot be used to find the absolute wavelength (since you will rarely know the order number). Here are some suggestions

1. Record the interference pattern using a laser. Show that r^2 is indeed proportional to the order number.
2. Since the laser is very monochromatic you can use the width of your fringes to estimate the finesse of your etalon.
3. If you record the pattern from a sodium lamp you can easily show that there are two sequences, one from each of the sodium D lines, and that the difference between them corresponds to their difference in wavelength.

Note: If you photograph the interference patterns, then I have a small program which will allow you to measure the radii of the circles quite easily.

Report

It is now time to start putting together the main structure of a research paper. A full report consists of the following

- Abstract
- Introduction, including outline of theory behind the etalon.
- Experimental apparatus and method
 - Brief description of equipment, included relevant data such as etalon spacing,
 - How to analyze the data
- Data

- A sample spectrum is optional, but not obligatory
- Analysis
 - Comparison with theory
 - size of circles
 - finesse
- Conclusion