Diffraction – Michelson Interferometer

Equipment

- Optics table, mirrors, mounts, laser and beam splitter

Objectives

- Experimental
    - Design and construction of Michelson Interferometer
    - Use of optical equipment.
- Data Analysis
    - Understanding conditions for interference
    - Error propagation**,** random and systematic errors

Introduction

Interference is a wave phenomenon that can be observed with light, sound and even matter. The Michelson Interferometer was used try and experimentally observe the luminiferous aether. This experiment had a significant negative outcome.

Pre-lab Queries

- Why is it important to avoid touching (or breathing on) optical surfaces?
- Sketch a Michelson Interferometer
- What are the required conditions to obtain interference?
- Can you observe interference from a "white light" source (like an incandescent light bulb)?

Basic Lab

Construct a Michelson Interferometer.

- Use your interferometer to determine the index of refraction for a glass slide.

Note: Be careful handling optical components – especially optical surfaces. Front silvered mirrors should never be touched or wiped.

Advanced Lab

- Determine the spatial and temporal coherence length of your light source.
- Determine whether you can obtain interference patterns using two different lasers.
- Setup a white light interferometer.

References

- M. Vollmer and K.-P. Möllmann, "Michelson Interferometer for Your Kitchen Table", **Phys. Teach. 46** Feb (2008) pp 114-117
- M. Vannonia and G. Molesinib, "Speckle Interferometry experiments with a digital photocamera" **Am. J. Phys. 72** July (2004) pp 906-909