
Chapter 7: The Michelson Interferometer

Overview

Since the index of refraction of air is so close to 1.0, it is very difficult to measure. We will use the interference patterns created by a Michelson interferometer to help us determine n_{air} to five significant digits.

Suggested Reading Assignment

The section on the Michelson Interferometer in your calculus-based physics book.

The section on the Michelson-Morley experiment in your modern physics textbook.

E.g., Section 36-8 of Halliday, Resnick, and Walker, 6th edition, and Section 1-1 of Tipler and Llewellyn, 4th edition.

Pre-lab Questions

1. Describe in your own words how the Michelson interferometer works. Draw a careful diagram.
2. The interference pattern can be made to shift if a material of thickness d is inserted in *one* of the arms of the interferometer. Derive an expression for the fringe shift ($N_{\text{material}} - N_{\text{air}}$) in terms of the thickness d , the refractive index of the material n , and the wavelength of light λ . Be prepared to solve problems based on these ideas for your pre-lab quiz.
3. Describe the Michelson-Morley experiment. This is the most famous negative experiment in physics. What was the objective of the physicists? What were the results? How did this change our view of the physical world?