STANDARD EXPERIMENTS IN PHYSICS 331

Revised September 18, 2012.

1. **Velocity of Light** A pulsed laser, detector and oscilloscope is used to time the transit of light along a path. The answer is 2.99792458 x 10^{10}cm-s^{-1}, what is the question?

2. **Concave Diffraction Grating** A concave grating in a Rowland mount is used to determine the Rydberg constant for atomic hydrogen. The spectral resolution of the grating is investigated through a measurement of the spectrum of atomic deuterium.

3. **Fabry-Perot Interferometer** A modular mirror system is used to construct and investigate the properties of the most widely used type of multiple-beam interferometer. It is used to measure the mode structure of HeNe lasers operating at $\lambda = 633$ nm and $\lambda = 544$ nm.

4. **Michelson Interferometer** A modular mirror system is used to set up and investigate the properties of an historically significant interferometer. Interference patterns are observed for three types of light sources: a laser, an incandescent lamp (white-light), and a sodium lamp. The yellow sodium D lines are used to illustrate the Fourier transform properties of the interferometer.

5. **Fraunhofer and Fresnel Diffraction in One Dimension** Fraunhofer diffraction is "far-field" diffraction from a single slit and from equally spaced multiple slits. The patterns observed can be interpreted in terms of the Fourier transform of an aperture function. Fresnel Diffraction is "near-field" diffraction. We study the pattern from an adjustable-width slit and a half plane, and explore the transition from Fresnel diffraction to the Fraunhofer limit. A linear photodetector array is used to acquire a digitized output of the light intensity in the diffraction patterns. This allows a quantitative comparison with the theory.

6. **Reflection of Light at an Air-Dielectric(Glass) Interface** Reflection from a glass plate is studied as a function of the angle of incidence, the polarization and the wavelength. Time permitting, the same study can be made for a glass surface with an antireflection coating.

7. **Faraday Rotation** The rotation of the plane of polarization of light propagating along a magnetic field in a dispersive medium is studied as a function of magnetic field and compared to a simple theory.

8. **Holography** The relationship between a hologram and a diffraction pattern is explored by making and viewing transmission holograms with a HeNe laser. NOTE: you must complete at least one of the following experiments before attempting the holography experiment: Fabry-Perot interferometer, Michelson interferometer, or Fraunhofer and Fresnel diffraction.