

Physics Lab #10: Diffraction

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Objective: The objective of this lab was to measure the wavelength of a beam of light using a diffraction grating and to demonstrate the diffraction of light using a laser and different slit configurations.

Theory:

Part one: The wavelength of light can be measured using a diffraction grating using $d \sin \theta_n = n\lambda$ where d is the distance between the gratings, θ is the angle, n is the order, and λ is the wavelength.

Part two: When light strikes a slit, every point on the slit acts as a wave source. The wave fronts from each point expand outward until they hit the screen. If the wave fronts are 180 degrees off of one another, a dark spot will form. The size of the slit must be $b \sin(\theta) = \lambda$ where b is the slit width. For more than one dark spot, $n\lambda = d \sin(\theta)$ where d is the slit separation.

Procedure:

Part one:

Clamp grating in place, line up the telescope with the direct ray OM. Slowly move the telescope away from the ray until a spectral line appears. Read the angle reading. Slowly move the telescope to the other side of the ray until the same spectral. Repeat for several spectral lines.

Part two: Point the laser so that the light is projected through the diffraction pattern wheel onto the screen beyond. Measure the interference pattern spacing and the distance between the pattern and the slit wheel. Repeat for single, double, and multi slit openings.