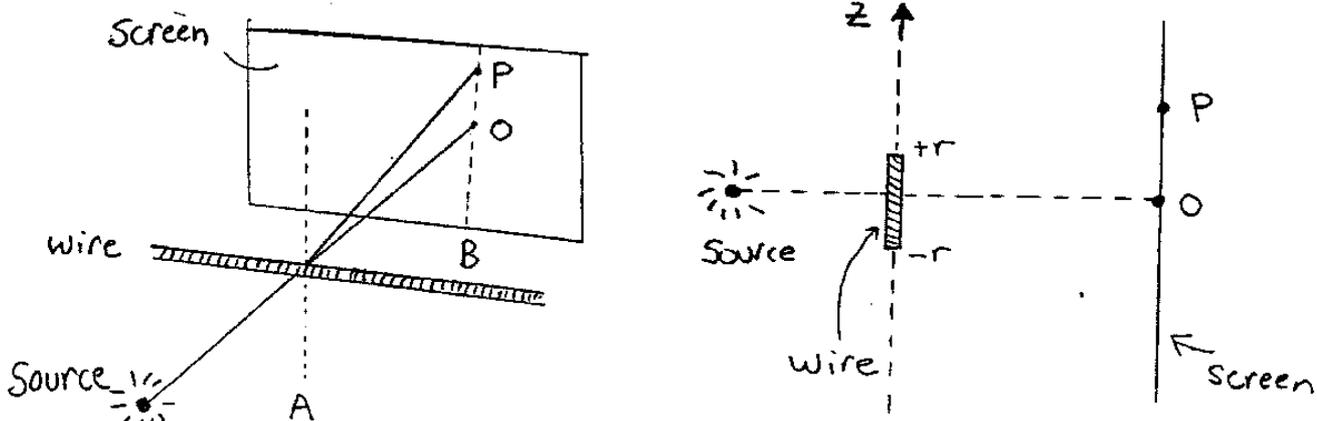


Physics 2P51

Assignment 6: Due: Monday April 9, 2018 in drop box across from MC B210a by 12:00 noon.

- Textbook, page 252, problem 14-7. If a car's headlights are 122 cm apart, then, assuming pupils 4.00 mm wide in diameter and light of 500.0 nm wavelength, what is the maximum distance at which the eye can resolve them?
- In Fresnel diffraction from a wire of radius r (left figure below) the wavefront is blocked from $-r$ to r as illustrated in the figure to the right which shows a 2-D cut intersecting the lines labelled A and B in the left figure. Thus the irradiance at a point like P on the screen is determined by adding the contributions of the two transmitted portions of the wavefront.



Consider a wire 0.50 mm thick which is placed 2.00 m from a point light source of wavelength 630.0 nm and 3.00 m from the screen. Compute the irradiance of the diffraction pattern at the screen at point O on the optical axis. Write your final answer as a percentage of the irradiance of the unobstructed wavefront.

- Collimated light containing the wavelengths 600 nm and 610 nm is diffracted by a plane grating ruled with 60 lines to the millimeter. If a lens of 2 m focal length is used to focus the light on a screen, what is the linear distance between these two lines in the first order?
- Light is incident on a water surface at such an angle that the reflected light is completely linearly polarized.
 - What is the angle of incidence?
 - The light refracted into the water is intercepted by the surface of a block of glass with index 1.50. The light reflected from the glass is completely linearly polarized. What is the angle between the glass and water surfaces? Sketch the arrangement showing the polarization of the light at each stage.
- A number of dichroic polarizers are available, each of which can be assumed perfect. That is, each passes 50 % of the incident unpolarized light.
 - What percentage of the incident light is transmitted by a pair of polarizers when their transmission axes are set parallel?
 - What percentage of the incident light is transmitted by a pair of polarizers when their transmission axes are set at 0° and 90° ?
 - If a third polarizer is placed between the two polarizers of part (b) such that its polarization vector lies halfway between them at 45° , what percentage of the incident light is transmitted?
 - If seven polarizers are placed in series such that the transmission axis of the first is set at 0° , the second at 15° , the third at 30° , the fourth at 45° , the fifth at 60° , the sixth at 75° , and the seventh at 90° , what percentage of the incident light is transmitted?