

PHYS 251: Atomic Physics Lab

Due date: Tuesday, Oct. 29, 2024 by 11:59 pm on Gradescope (both sections)

Pre-Lab Exercise: Single Photon Interference

Problem: Single slit diffraction & double slit interference

(a) Consider laser light, with an intensity $I_0 = 1 \text{ W/m}^2$ and a wavelength $\lambda = 670 \text{ nm}$, directed at a metal screen that contains a single slit of horizontal width $a = 0.1 \text{ mm}$ for passing the light. The light that makes it through the slit then travels a distance $\ell = 0.5 \text{ m}$ before landing on a viewing screen where its intensity profile can be measured (e.g. with a photodiode or PMT).

Write a short program in Python (e.g. using Google Colab) that uses equation 2 from the lab instructions to plot the intensity profile $I_{SS}(x)$ on the viewing screen as a function of horizontal position x .

(b) Next, the single slit is replaced with a double slit with a separation between the slits of $d = 0.4 \text{ mm}$ and with the same width for both slits as the single slit in part (a).

Write a short program in Python that uses equation 1 from the lab instructions to plot the intensity profile $I_{ds}(x)$ on the viewing screen as a function of horizontal position x .