

PHYS 251: Atomic Physics Lab

Due date: Tuesday, Oct. 31, 2023 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  $x$ .