

## PH481 Homework 6

Due: Friday, 24<sup>th</sup> of February 2023

**10.2\*** In Section 10.1.3 we talked about introducing an intrinsic phase shift  $\epsilon$  between oscillators in a linear array. With this in mind, show that Eq. (10.18) becomes

$$\beta = (kb/2)(\sin \theta - \sin \theta_i)$$

when the incident plane wave makes an angle  $\theta_i$  with the plane of the slit.

**10.8\*** A narrow single slit (in air) in an opaque screen is illuminated by infrared from a He–Ne laser at 1152.2 nm, and it is found that the center of the tenth dark band in the Fraunhofer pattern lies at an angle of  $6.2^\circ$  off the central axis. Determine the width of the slit. At what angle will the tenth minimum appear if the entire arrangement is immersed in water ( $n_w = 1.33$ ) rather than air ( $n_a = 1.00029$ )?

**10.15\*** Two long slits 0.10 mm wide, separated by 0.20 mm in an opaque screen, are illuminated by light with a wavelength of 500 nm. If the plane of observation is 2.5 m away, will the pattern correspond to Fraunhofer or Fresnel diffraction? How many Young's fringes are visible within the central bright band?