

Phys 362
Assignment 2

1. A laser operating at $\lambda = 632 \text{ nm}$ produces a harmonic electromagnetic wave propagating in free space. The beam area is 4 mm^2 (assume uniform) and the average power is $30 \text{ }\mu\text{W}$. The beam impinges on a specimen at time $t = 0$. The electric field part of the wave can be described with $E = E_0 \sin(kx - \omega t)$. There is a magnetic field part also.
 - (a) Plot the power density (W/m^2) received as a function of time from the moment the beam is turned on out to a time of 10 fs . Assume the beam can be turned “instantly on”). Show any calculations.
 - (b) Calculate the *time averaged* Poynting vector (i.e., the irradiance) received by the sample over a time interval $\Delta t = 0$ and $\Delta t = \infty$, starting from the moment the light hits the sample at $t = 0$.
 - (c) Plot the average irradiance received as a function of time from the moment the beam is turned on using a log scale for the x-axis. Show any code you use.