

PHGN 462 Recitation 1

As always, make sure you interpret your results and discuss them amongst your group.

1) Consider a charging parallel plate capacitor with circular plates of area A separated by distance d . There is a current I flowing into one plate and out of the other.

- a) Write E and B as a function of time in the space between the plates.
- b) Find the energy density u_{EM} and the Poynting vector in the gap between the plates. Pay particular attention to the direction of the Poynting vector. Does the direction of the Poynting vector make physical sense? Also check that Poynting's theorem is satisfied.
- c) Write an expression for the total energy in the space between the plates as a function of time. Calculate the total power flowing into the space, by integrating the Poynting vector over the appropriate surface. Check that the power input is equal to the rate of increase of energy in the gap. Note: You can ignore fringing fields and still have it all work out.

2) Suppose the E-field in an electromagnetic wave is

$$\vec{E} = \frac{E_0}{\sqrt{2}} (\hat{k} - \hat{i}) \sin(ky - \omega t)$$

- a) Determine \vec{B} (there can be only one).
- b) Find the Poynting vector, and make sure the direction of it is sensible. Also make sure the functional form is reasonable.