PHYSICS 24 Section

Feb. 2, 2012

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FIELDS - THEY ARE A-CHANGIN'. (IN TIME)

A square loop of wire with side length a lies in the x-y plane, in the presence of a time-dependent magnetic field given by

$$\vec{B} = B\sin(\omega t)\,\hat{z}.$$

- What is the induced emf $\mathcal{E}$ in the wire?

- Suppose the wire is characterized by resistivity ρ and cross-sectional area b. Calculate the following:

  → The current in the wire.

  → The power output $P(t)$ of the wire, and its time-average $\langle P \rangle$.

Now suppose the field is given by $\vec{B} = B\sin^2(\omega t)\,\hat{z}$.

→ This field never changes direction! Does that mean there is no induced $\mathcal{E}$?? Explain why not.

→ Repeat your calculations for this new system, and compare the values for $\langle P \rangle$.