

## Polarization and Propagation Direction

**Reading assignment**

Ulaby, 7-3

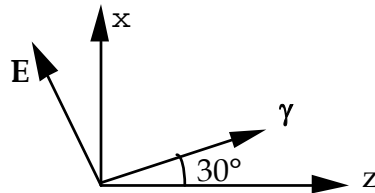
**Problem 1 - polarization**

Consider a wave travelling in the  $z$  direction whose electric field is given by  $\mathbf{E}(z,t) = 3 \cos(\omega t - \beta z)\mathbf{a}_x + C \cos(\omega t - \beta z + \phi)\mathbf{a}_y$ . Describe the polarization (e.g. linear, right circular, etc.) and on an  $xy$  plot sketch the locus of  $\mathbf{E}(0,t)$  over a cycle for the following cases.

- a)  $C = 4 \text{ V/m}$ ,  $\phi = 0^\circ$       b)  $C = 3 \text{ V/m}$ ,  $\phi = 45^\circ$

**Problem 2 - Arbitrary propagation angle**

The direction of  $\mathbf{E}$  and  $\boldsymbol{\gamma}$  of an electromagnetic wave with  $\lambda = 500 \text{ nm}$  are shown below. The wave is traveling through air. The electric field has a magnitude of  $30 \text{ V/m}$ . What are the  $\mathbf{E}$  and  $\mathbf{H}$  phasors?



$y$  axis is out of the page