Engineering 7811 Tutorial 1

Winter 2016

1. The electric field of a particular e-m wave given by $\vec{E} = \hat{x}E_0 \cos\left[10^8\pi \left(t - \frac{z}{c}\right) + \theta\right]$ is the sum of $\vec{E}_1 = \hat{x}0.03 \sin\left[10^8\pi \left(t - \frac{z}{c}\right)\right]$ and $\vec{E}_2 = \hat{x}0.04 \cos\left[10^8\pi \left(t - \frac{z}{c}\right) - \frac{\pi}{3}\right]$ where c is the velocity of light. Find E_0 and θ .

2. Given that the E-field of a particular spherical wave in free space is

$$\vec{E} = \hat{\theta} \left(\frac{E_0}{r} \right) \sin \theta \cos(\omega t - kr) ,$$

determine the \vec{H} field.

3. The time average Poynting vector (average power density) for the radiation from a particular antenna is given by

$$\vec{\mathcal{P}}_a = A_0 \frac{\sin \theta}{r^2} \hat{r} \quad W/m^2$$

where A_0 is the peak value of the power density, θ is the usual spherical coordinate, and \hat{r} is the radial unit vector. Determine the total radiated power.