EE 483/583 Antennas for Wireless Communications (Spring 2024)

Homework 2

Tuesday, January 23, 2024

1) 2.33bcf For part b, assume E_x = 0.5 V/m and E_y = 1 V/m. For parts c & f, assume $E_x = E_y = 1$ V/m Also, in each case, write-out a time-domain equation for the electric field, plot/sketch the polarization ellipse w/ wave propagating into page, annotate RH/LH instead of CW/CCW, and find tilt angle with respect to the $+\mathcal{E}_y$-axis.

2) A plane wave $\overline{\mathcal{E}_i} = \hat{a}_x 60\cos(\omega t - 20^\circ - \beta y) + \hat{a}_z 80\cos(\omega t + 40^\circ - \beta y)$ (V/m) is incident on an infinitesimal dipole located at the origin and oriented along the *z*-axis. What direction is the plane wave traveling? Sketch the polarization ellipse of the incident plane wave w/ wave propagating into page and annotate with its polarization. Next, find $\hat{\rho}_w$, $\hat{\rho}_a$, and the PLF when θ = 90° and ϕ = 270°. [Hints: Look at Chapter 4 section on infinitesimal dipoles and remember how to convert from spherical to Cartesian unit vectors.]

3) 2.45

4) 2.53 Make **generator** peak voltage 12 V and impedance of 50 - *j* 20 Ω. [Hint: Look at Chapter 4 section on λ/2 dipoles.]

5) 2.57 with length of λ/50 and radius of λ/250. [Hint: look at Chapter 4.]

6) **EE 483 only:** 2.68 Assume a lossless 75 Ω transmission line of length 1.7λ connects source and dipole. [Hint: Look at Chapter 4 section on λ/2 dipoles.]

7) **EE 583 only:** 2.67 For part a, plot/sketch polarization ellipse w/ wave propagating into page for a radiated wave traveling down the +*x*-axis assuming E_0 = 1000 V/m and $\frac{e^{-jkr}}{r} = 0.01\angle 0^\circ$ (m^{-1}).

Due Tuesday, January 30, 2024.

Note: For all plots/sketches, the positive axes must be to the top or right.