EE 483/583 Antennas for Wireless Communications (Spring 2025)
Homework 2
Friday, January 31, 2025

1) 2.33ad Assume E_y = 1 V/m. Also, in each case, write-out a time-domain equation for the electric field, plot the polarization ellipse with wave propagating into page, annotate RH/LH instead of CW/CCW, and find tilt angle with respect to the $+\mathcal{E}_y$-axis.

2) 2.37 For plots, $E_0 = E_a = 1$ V/m. For part (a), write-out a time-domain equation for the electric field, plot the polarization ellipse w/ wave propagating **out** of page, annotate RH/LH, and find tilt angle with respect to the $+\mathcal{E}_y$-axis. For part (b), write-out a time-domain equation for the electric field, plot the polarization ellipse w/ wave propagating **into** page, annotate RH/LH, and find tilt angle with respect to the $+\mathcal{E}_y$-axis. For part (c), also find $\hat{\rho}_w$ & $\hat{\rho}_a$.

3) 2.53 Assume loss resistance is 2 Ω. Hint: Look at Chapter 4 section on λ/2 dipoles.

4) 2.53 Assume loss resistance is 2 Ω and the generator has a lossless 50 Ω transmission line of length 1.65λ connecting it to the antenna.

5) 2.57 Change dipole length to λ/50, radius to λ/275, and wire to tungsten (σ_w = 1.8×10^7 S/m). Hint: Look at Chapter 4 section on infinitesimal dipoles.

6) **EE 583 only:**
A plane wave $\bar{\mathcal{E}} = \hat{a}_x 80\cos(\omega t + 20^\circ - \beta y) + \hat{a}_z 60\cos(\omega t - 40^\circ - \beta y)$ (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 plane wave w/ wave propagating into page and annotate with its polarization. What are $\hat{\rho}_w$, $\hat{\rho}_a$, and the PLF when $\theta = 90°$ and $\phi = 30°$? [Hints: Look at Chapter 4 and remember how to convert from spherical to Cartesian unit vectors.]

Due Wednesday, February 5, 2025