Antennas

22/07/15

Name:

Exercise 1

a) Write a mathematical expression for the current distribution in a half-wavelength resonant dipole and plot this current as a function of the position.

b) Starting from the knowledge of the far-field of a short dipole (having length *dz*)

$$E_\theta = j\eta \frac{\beta}{4\pi} I_0 dz \frac{e^{-j\beta r}}{r} \sin\vartheta$$

$$H_\varphi = j \frac{\beta}{4\pi} I_0 dz \frac{e^{-j\beta r}}{r} \sin\vartheta$$

show how the far-field of the half-wavelength resonant dipole can be calculated (the explicit solution of the final integrals is not required).

c) What is the value of the input impedance of a half-wavelength dipole at the working frequency ?

d) Plot qualitatively the input resistance of a wire antenna as a function of its length. Explain how this result depends on the wire radius.

e) Plot qualitatively the input reactance of a wire antenna as a function of its length. Explain how this result depends on the wire radius.

Antennas

22/07/15

Name:

Exercise 2

a) Define and explain the linear polarization of the electromagnetic field. Give an example of a source emitting a linearly polarized field.

b) Define and explain the circular polarization of the electromagnetic field. Give an example of a source emitting a circularly polarized field.

Antennas

22/07/15

Name:

Exercise 3

Let us consider a uniform broadside array composed of 3 isotropic antennas whose working frequency and separation are 2.4 GHz and 12.5 cm, respectively.

a) Calculate the directions of the main lobes.

b) Calculate the null directions.

c) Plot the radiation pattern.