

## Homework 1: ECE 4370

### Introduction to Radiating Systems

#### 1. Energy-Harvesting Circuit:

You must select an antenna to connect to an RF energy-harvesting circuit having load impedance  $100 - j200\Omega$ . You are trying to decide between using a resonant half-wave dipole antenna with an antenna impedance of  $73\Omega$ , or a half-wave *folded* dipole antenna with a much larger impedance of  $292\Omega$ . Answer the following questions based on this scenario:

1. Calculate the mismatch losses for both antennas and determine which one couples the most power into the RF energy-harvesting circuitry.
2. Which antenna would result in the largest amplitude of input voltage for the RF energy-harvesting circuitry?
3. If you had the freedom to tune the reactance,  $X_L$ , of the harvesting circuitry arbitrarily, which value would result in identical voltage amplitudes at the terminals of either the dipole or the folded dipole.

(15 points)

2. You are feeding an electrically short monopole transmit antenna that has an impedance value of  $15 - j90\Omega$  using a  $50\Omega$  transmission line. How much increase in transmitted power will be experienced (in dB) if a matching network is added?

(5 points)