EEC133 Pre-Lab 2: Loop Antennas

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Contents

Pre-Lab

Part 1: Loop Antenna Design

Questions:

1. $r = 0.0064$m. $\lambda = \frac{c}{f} = 0.12$m. $r \leq \frac{\lambda}{6\pi} \approx 0.00637$m.
2. $$\text{Radiation Resistance: } 320\pi^6 \left(\frac{0.00637}{0.12}\right)^4 = 2.44\Omega$$
$$\text{Directivity: } 1.5$$
$$\text{Half-power beamwidth: } \frac{\pi}{2}$$
$$\text{Far Field Requirement: } r >> \frac{0.12}{2\pi} = 0.019\text{m}$$

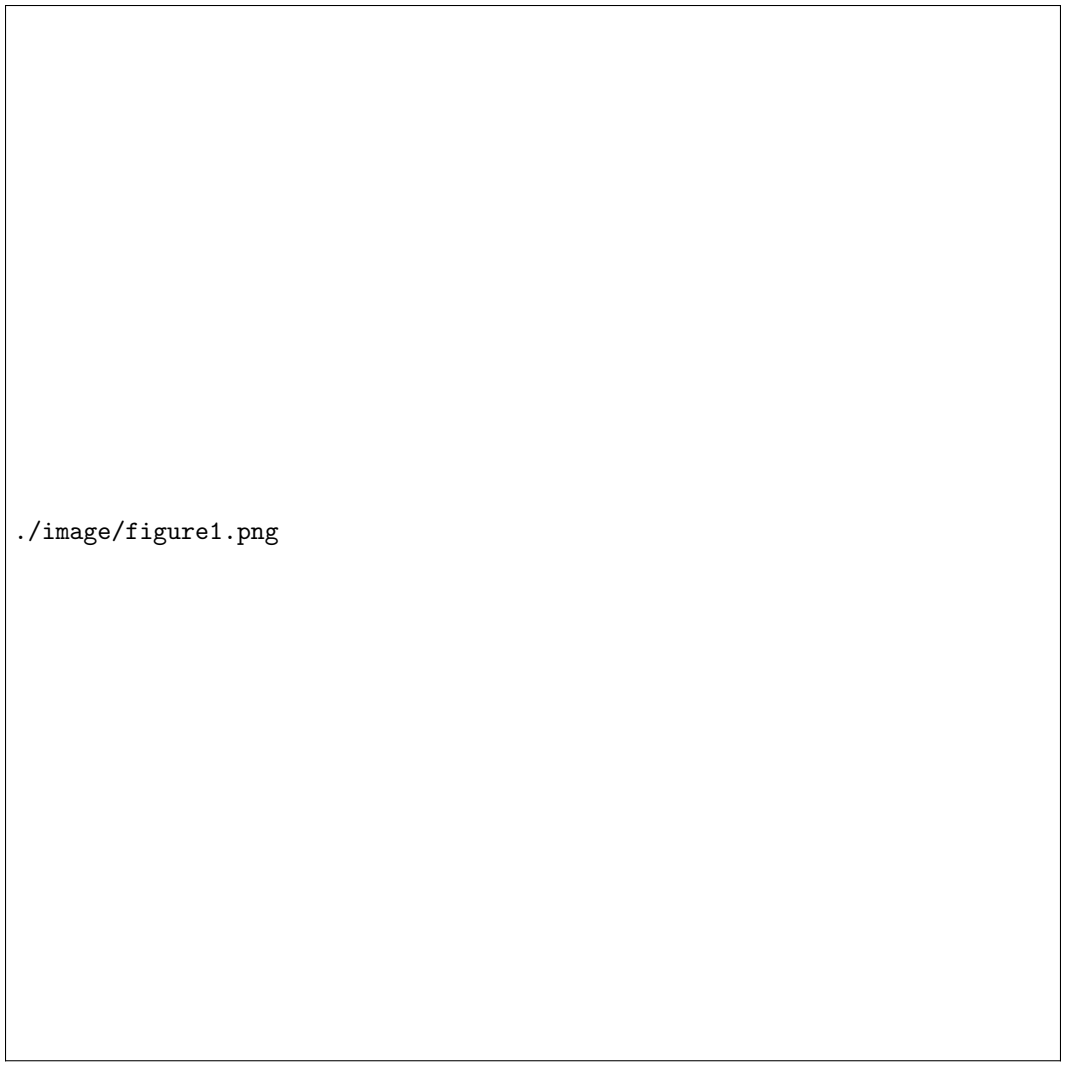

Figure 1:

3.

Part 2: More Noise Calculations

Questions:

1. R_{in} and R_{out} are typically 50Ω to avoid wave reflection in R_{in} by matching the characteristics impedance in the input and output transmission line. R_{out}

2. Noise =
$$9.1 * 10^{-10} \frac{V}{\sqrt{Hz}}$$

This unit means that the noise voltage is $9.1 * 10^{-10}$ volts per unit of the frequency bandwidth.

3. $R_{in} = 0.489\Omega$, so $\tau = 0.019$. The small transmission coefficient implies that very little power will be transmitted to the amplifier, so the signal amplification will be poor.