

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

Homework 7

Tuesday, February 27, 2024

- 1) Design a six-element Yagi-Uda antenna for VHF television channel 13 using a copper-pipe boom with an outer diameter of 9/16 inch and brass elements with an outer diameter of 3/8 inch. Assume boom will need to extend 12" past center of reflector to allow antenna to be attached to an antenna mast, and 1" past center of last director for mechanical strength.
 - a) Tabulate design specifications (assume 75Ω feeding transmission line).
 - b) Show complete design procedure (i.e., include design figures, spreadsheets, ...) in a fashion similar to example given in class. **No matching network is required.**
 - c) Make a **scale** drawing(s) of the final antenna designed including boom (transmission line may be omitted) that a machinist could take and use to build the antenna (use centimeters for all dimensions).
- 2) A PEC folded dipole used for FM radio reception has length $l = 1.46$ m, wire spacing $s = 2$ cm, and wire diameter $2a = 1.29$ mm. Find the characteristic impedance of transmission line mode and equivalent radius of the antenna mode. Then, at 88, 97.5, and 108 MHz, find: a) the length of the folded dipole in wavelengths (l/λ), b) the input impedance of transmission line mode, c) the input impedance of antenna mode using NEC-2 [include input file(s) & excerpt of output file(s)], d) the exact & estimated input impedance, and e) the VSWR on a 300Ω feeding transmission line. Show all work.

Due Thursday, March 7, 2024

Note: Assume $c = 2.998 \times 10^8$ m/s.