EE 481/581 Microwave Engineering (Fall 2024)
Homework 2
Wednesday, September 11, 2024

1) We have made a parallel plate transmission line by cutting a 0.8" wide strip from a 0.5" thick aluminum-foil (6 μm thick) covered styrofoam board from Menards. If the transmission line is operated at 3 GHz at room temperature, determine: a) the effective conductivity and complex permittivity of the styrofoam, and b) the distributed parameters R, L, G, & C of the transmission line. [Hint: Appendices E, F, & G.]
2) For the parallel plate transmission line in 1), calculate: a) propagation constant, b) attenuation constant (both Np/m and dB/m), c) phase constant, d) characteristic impedance (both polar & rectangular forms), e) wavelength, and f) phase velocity.
3) Similar to equations (2.40a) & (2.40b), determine equations for I_{max} & I_{min} and the corresponding reflection coefficient conditions for each. Note that I_{max} & I_{min} pair up with V_{max} & V_{min} at corresponding locations, which goes with which?
4) For each current & voltage pair in 3), define an impedance as the ratio of phasor voltage to current and determine equations for Z_{max} and Z_{min}.
5) 2.1
6) 2.10
7) 2.11
8) 2.15
9) EE 581 only- 2.7

Due Monday, September 16, 2024.

- Express all currents, voltages, & reflection coefficients in the polar/phasor format with angles in degrees (e.g., $10\angle 30^\circ\,\mathrm{V}$). Express complex permittivity & impedances in rectangular format (e.g., $10 + j30\,\Omega$).