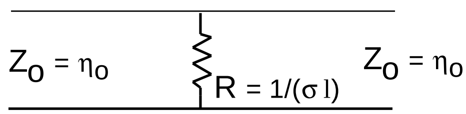
EE 363M Spring 2000
Homework Set 5
Fri. March 31
Due: Fri. April 7

1. (10 points)
a) Consider a plane wave which strikes a metal sheet of thickness much **greater** than a skin depth at normal incidence. The dielectric from which the wave is incident is air. What is the appropriate T-line equivalent circuit model you need to find the reflection coefficient off of the sheet? (hint: do you really need to know how thick the metal is in this case?) From this, how much **power** is reflected from the sheet?
b) If the frequency is 10 GHz, for a copper foil 25 μm thick, what fraction of incident power is reflected? How much is absorbed?

2. (10 points) Consider a plane wave which strikes a metal sheet of thickness *l* much **less** than a skin depth thick at normal incidence. The dielectric on both sides of this thin sheet is air. The appropriate T-line equivalent circuit model you need to find the reflection coefficient off of the sheet is shown below:



To get the equivalent circuit, I used the equation for the impedance at the front of the metal

$$\eta(z = -l) = \eta_m \frac{\eta_o + \eta_m \tanh(\gamma \cdot l)}{\eta_m + \eta_o \tanh(\gamma \cdot l)}$$

where η_m and γ are the appropriate quantities for a good conductor. I also needed to use the inequalities $l \ll \delta$, and $\sigma \gg \omega\varepsilon$ (which must be true since the metal is a "good conductor").

a) Using this T-line equivalent circuit model, how much power is absorbed by the sheet, reflected from the sheet, and transmitted through the sheet?
b) If the frequency is 60 Hz, for a copper foil 25 μm thick, what fraction of incident power is reflected, transmitted, and absorbed?