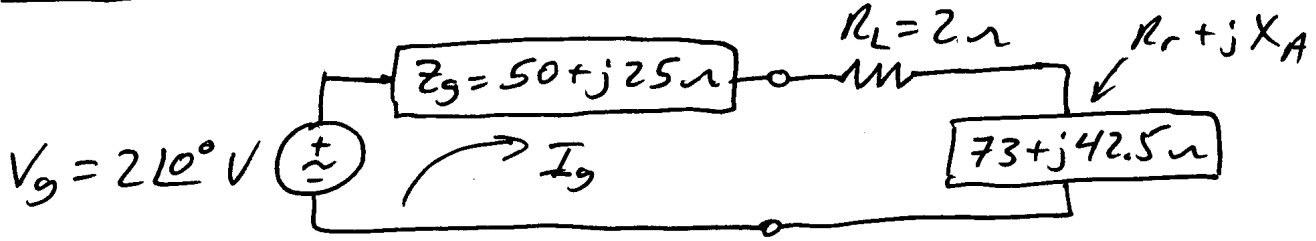
2.53 A $\lambda/2$ dipole, with a total loss resistance of 2 ohm, is connected to a generator whose internal impedance is $50 + j25$ ohms. Assuming that the peak voltage of the generator is 2 V and the impedance of the dipole, excluding the loss resistance, is $73 + j42.5$ ohms, find the power

(a) supplied by the source (real) (b) radiated by the antenna

(c) dissipated by the antenna

- Assume loss resistance is 2 Ω. Hint: Look at Chapter 4 section on $\lambda/2$ dipoles.

Equivalent circuit



$$I_g = \frac{V_g}{Z_{eq}} = \frac{2\angle 0°}{(50+j25)+2+73+j42.5}$$

$$= 0.0140785\angle -28.369°\ A$$

a) $P_{source} = \frac{1}{2}\,\mathrm{Re}\{V_g I_g^*\} = \frac{1}{2}\,\mathrm{Re}\{2\angle 0°\,(0.01408\angle +28.37°)\}$

$$= \mathrm{Re}\{0.01238774 + j0.00669\}$$

$$P_{source} = 12.3877\ mW$$

b) $P_{rad} = \frac{1}{2}|I_g|^2 R_r = \frac{1}{2}(0.0140785)^2\,73$

$$P_{rad} = 7.2344\ mW$$

c) $P_{loss} = \frac{1}{2}|I_g|^2 R_L = \frac{1}{2}(0.0140785)^2\,2$

$$P_{loss} = 0.1982\ mW$$