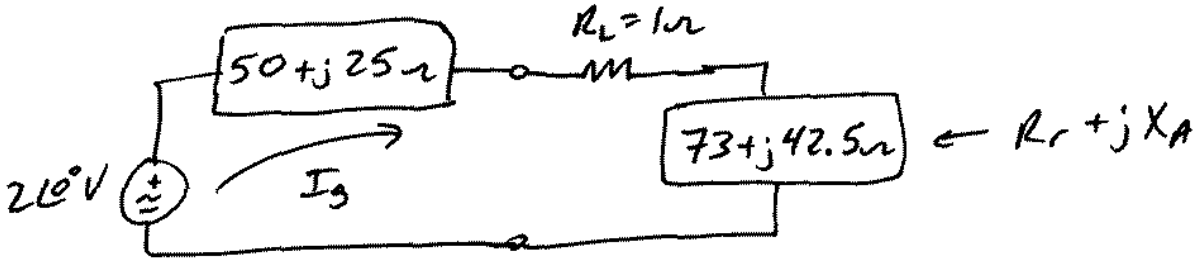
2.53 A $\lambda/2$ dipole, with a total loss resistance of 1 ohm, is connected to a generator whose internal impedance is $50 + j25$ ohms. Assuming that the peak voltage of the generator is 2 V and the impedance of the dipole, excluding the loss resistance, is $73 + j42.5$ ohms, find the power

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

(c) dissipated by the antenna

Equiv. Ckt.



$$I_g = \frac{2\angle 0° V}{(50+j25)+1+(73+j42.5)} = 0.01416615\angle -28.56188° \text{ A}$$

a) $P_{source} = \frac{1}{2}\,\text{Re}\{V_g I_g^*\} = \frac{1}{2}\,\text{Re}\{(2\angle 0°)(0.01416615\angle +28.562°)\}$

$= \text{Re}\{0.01244215 + j0.006773\}$

$P_{source} = 0.01244\ \text{W} = 12.442\ \text{mW}$

b) $P_{rad} = \frac{1}{2}|I_g|^2 R_r = \frac{1}{2}|0.01416615|^2(73)$

$= 0.0073\text{W} = 7.325\text{mW}$

c) $P_{loss\ antenna} = \frac{1}{2}|I_g|^2 R_L = \frac{1}{2}|0.01416615|^2(1)$

$= 0.0001\text{W} = 0.1003\text{mW}$