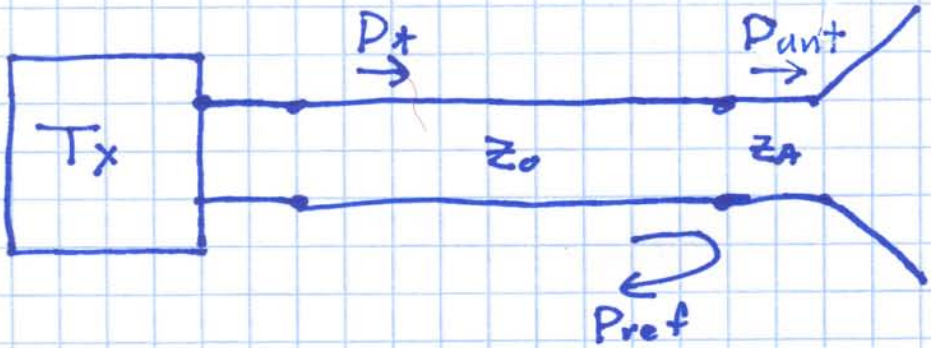
# Antenna Impedance

To transfer all available transmitter power to the antenna, we must make the reflected power = 0.




i.e. $P_t = P_{ant} + P_{ref}$

∴ make $P_{ref} = 0$, so that:

$$P_{ant} = P_t$$

To accomplish this, $Z_A$ must be matched:

$$\underline{Z_A = Z_0}$$

**Q:** Huh?? $Z_0$ is a real value, ∴ $Z_A = Z_0$ is a resistor !?!

⇒ It would seem that a resistor would make a lousy antenna!

- But, think about this. A resistor does not reflect power because it can absorb power. Reactive elements cannot absorb power, so power is reflected entirely.

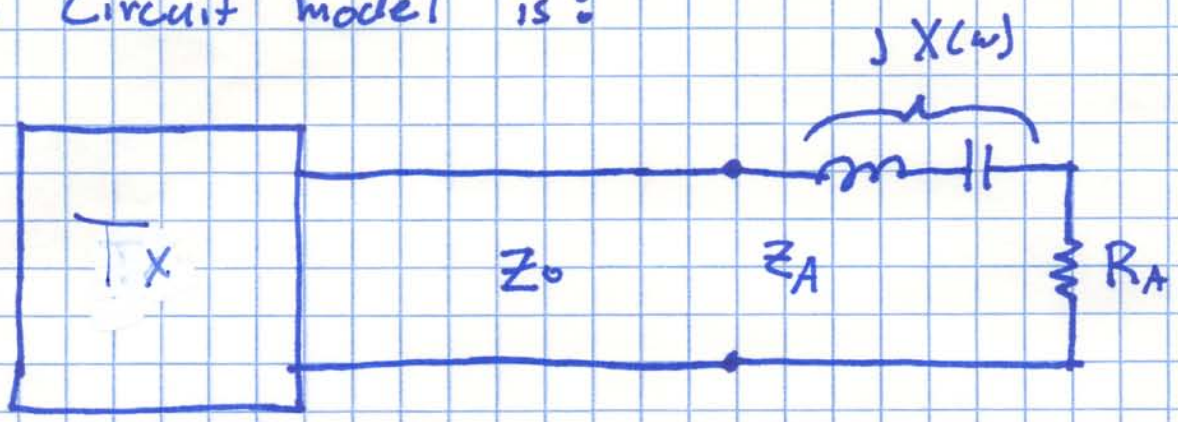
- Antennas absorb power as well; the difference is that antennas radiate this absorbed power, while a resistor converts it to heat.

> **Q:** Does this mean that antennas reflect no power??
>
> **A:** No! In general, antennas both reflect and absorb power.

i.e. $Z_A$ has both a real (resistive) and imaginary (reactive) component.

$$\Rightarrow \quad Z_A = R_A + jX_A$$

∞ Circuit model is:




Note antenna input impedance, like other antenna parameters, is generally frequency dependent.

**Q:** So how do we eliminate (or, at least minimize) the reflected power ??

**A1:** Design the antenna such that $R_A = Z_0$ (e.g. 50 Ω, 75 Ω, 300 Ω), and operate at frequency $\omega$ such that $X(\omega) \approx 0$. $\Rightarrow Z_A = Z_0$

**A2:** Implement a matching network!