Ham 70 – License, Power
Dr. Marc & Rosemary © 221018

1. The previous articles discussed impedance. Impedance is the ratio of voltage to current. $Z = V / I$.

2. Apparent power is the product of voltage and current oscillating at a frequency (AC).
   a. It is measured in Volt-Amps. $S = V \times I^*$.
   b. Real power (P) is from a resistor and lies on the x-axis. It is measured in Watts
   c. Reactive power (Q) is from reactance (inductor & capacitor). It is measured in Volt-Amp-Reactive, (Wattless) Reactive is identified with a 'j' and lies on the vertical axis.

3. The phase angle 'φ' between apparent (S) and real power (P) is identical to the impedance angle.
   a. Power factor is the ratio of real power to apparent power. It is also the COSINE (Cos) of the phase angle. $pf = P / S = Cos\,\phi$.
   b. Real power is apparent power times power factor. $P = S * pf$ or $P = S * Cos\,\phi$
   $P = VI\,Cos\,\phi$
   c. Cos 30 = 0.866   Cos 45 = 0.707   Cos 60 = 0.5

4. Real power depends only on the current and resistance.
   From impedance: $V = IR$
   From power: $S = VI^*$
   Combine: $S = I^2 R$, but only resistor so $P = I^2 R$

5. Ideal capacitors and inductors have no resistance.
   An inductor and capacitor oscillate at a resonant frequency.

6. Life is good. Enjoy!