EE331 — Basic Smith Chart Information

1. **To find the SWR**, draw a circle ("the SWR circle") centered at the origin of the Γ_r–Γ_i plane through the normalized load impedance z_L. The SWR is the value where the circle intersects the positive real axis (i.e., read the SWR value on the Γ_r axis).

2. If you're given the value of the SWR, just draw a circle centered at the origin through the value of the SWR on the Γ_r axis.

3. $|\Gamma|$ varies linearly from the center of the circle (i.e., the origin of the Γ_r–Γ_i plane) with $|\Gamma| = 0$ at the origin and $|\Gamma| = 1$ at the edge of the circle. Thus, **to find** $|\Gamma|$ you just need to figure out the ratio of the distance from the origin to the SWR circle and the distance from the origin to the edge.

4. The three outer scales on the edge of the circle give the distance on the line from the load or generator in wavelengths or degrees. **To find the angle of the reflection coefficient** θ_r, use the degree scale. Draw a line from the origin through the value of the load impedance to the degree scale. The value on the degree scale is the angle of the reflection coefficient.

5. **To find the input impedance** z_{in}, move clockwise toward the generator from z_L the distance of the length of the line in wavelengths along the SWR circle. If you're given z_{in}, you can **find the load impedance** z_L, by moving counter-clockwise toward the load from z_{in} the distance of the length of the line in wavelengths along the SWR circle.

6. Given the SWR and Γ, you can find the load impedance. **To find the load impedance** z_L **given the SWR and** Γ, draw the SWR circle and then locate the angle of the reflection coefficient along the degree scale. Draw a line from the origin to this angle. The value of the load impedance is where the line intersects the SWR circle.

7. **To find the voltage minima and maxima**, use the SWR circle. The first maximum is clockwise from the normalized load impedance z_L to $(\Gamma_r, 0)$ and the first minimum is clockwise from the normalized load impedance to $(-\Gamma_L, 0)$.

8. The normalized admittance ($y = Y/Y_0 = g + jb$) is opposite from the normalized impedance ($z = r + jx$) on the SWR circle. Thus, **to find the normalized admittance**, draw a line from the normalized impedance on the SWR circle through the origin and then through the SWR circle again. This intersection gives the value of the normalized admittance.

9. **cw** (clockwise) = toward the generator

10. **ccw** (counter-clockwise) = toward the load

11. One revolution of the circle ($= 360°$) is equal to a half-wavelength ($\lambda/2$) length of the line.