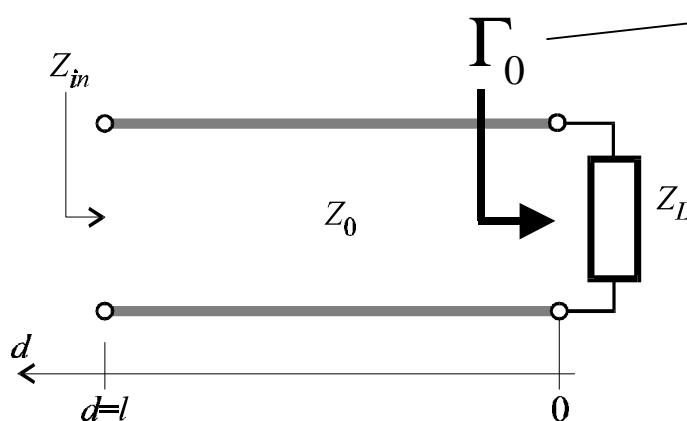


# From Reflection Coefficient to Load Impedance (Smith Chart)

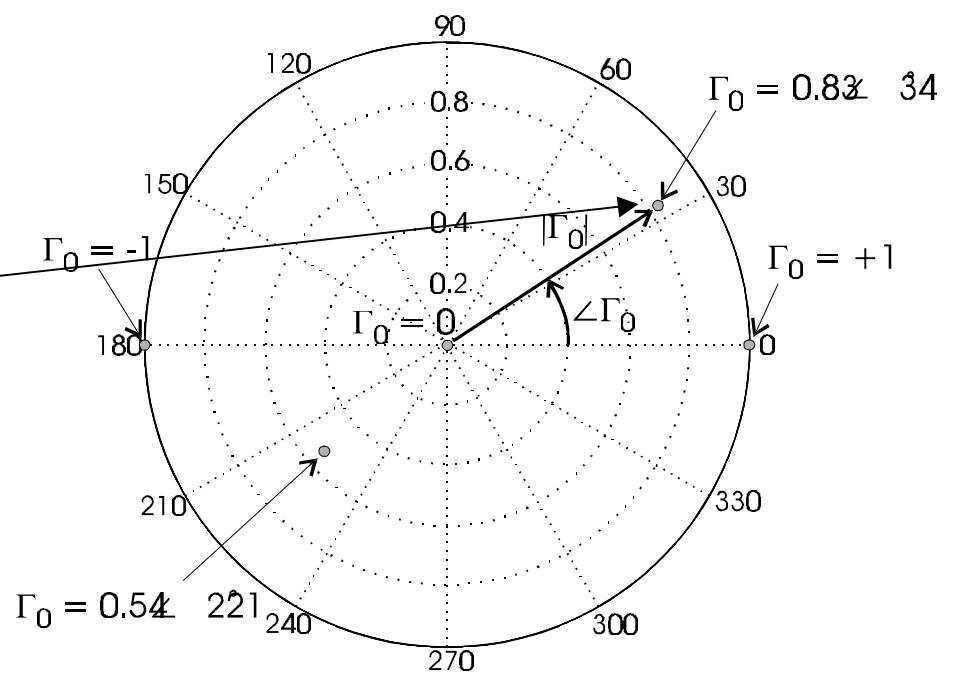
- Reflection coefficient in phasor form

$$\Gamma_0 = \frac{Z_L - Z_0}{Z_L + Z_0} = \Gamma_{0r} + j\Gamma_{0i} = |\Gamma_0| e^{j\phi_L}$$

The load reflection coefficient is identified in the complex domain



EEE194RF\_L8



2

## Normalized impedance

$$Z_{in}(d)/Z_0 = z_{in} = r + jx = \frac{1 + \Gamma(d)}{1 - \Gamma(d)} = \frac{1 + \Gamma_r + j\Gamma_i}{1 - \Gamma_r - j\Gamma_i}$$

$$\Gamma(d) = |\Gamma_0| e^{j\varphi_L} e^{-j2\theta d} = \Gamma_r + j\Gamma_i$$

Real part of normalized impedance

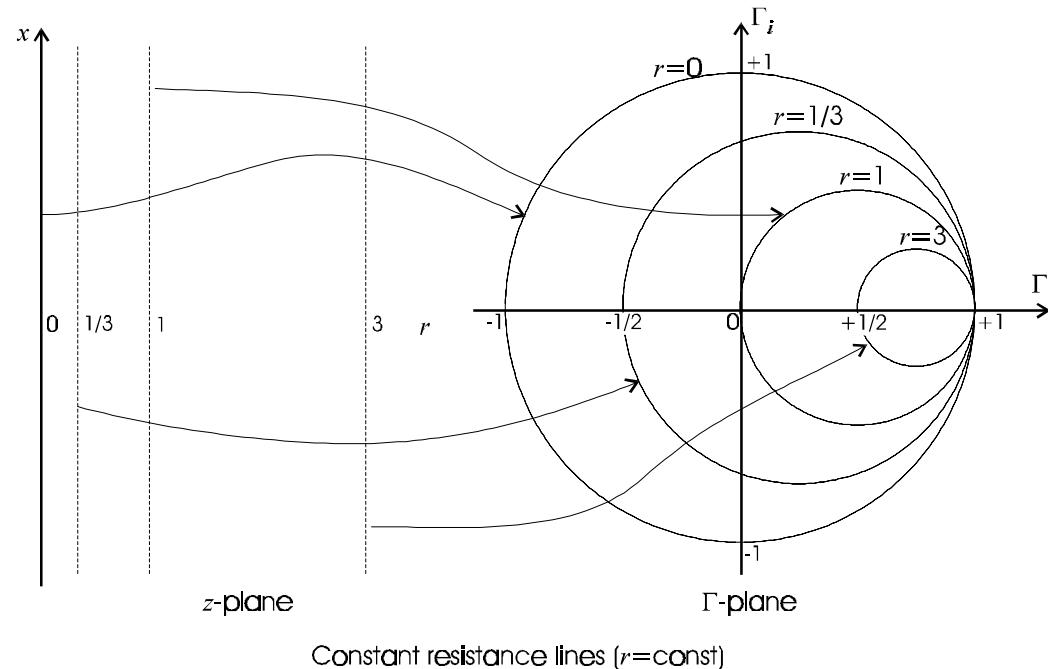
$$r = \frac{1 - \Gamma_r^2 - \Gamma_i^2}{(1 - \Gamma_r)^2 + \Gamma_i^2}$$

Imaginary part of normalized impedance

$$x = \frac{2\Gamma_i}{(1 - \Gamma_r)^2 + \Gamma_i^2}$$

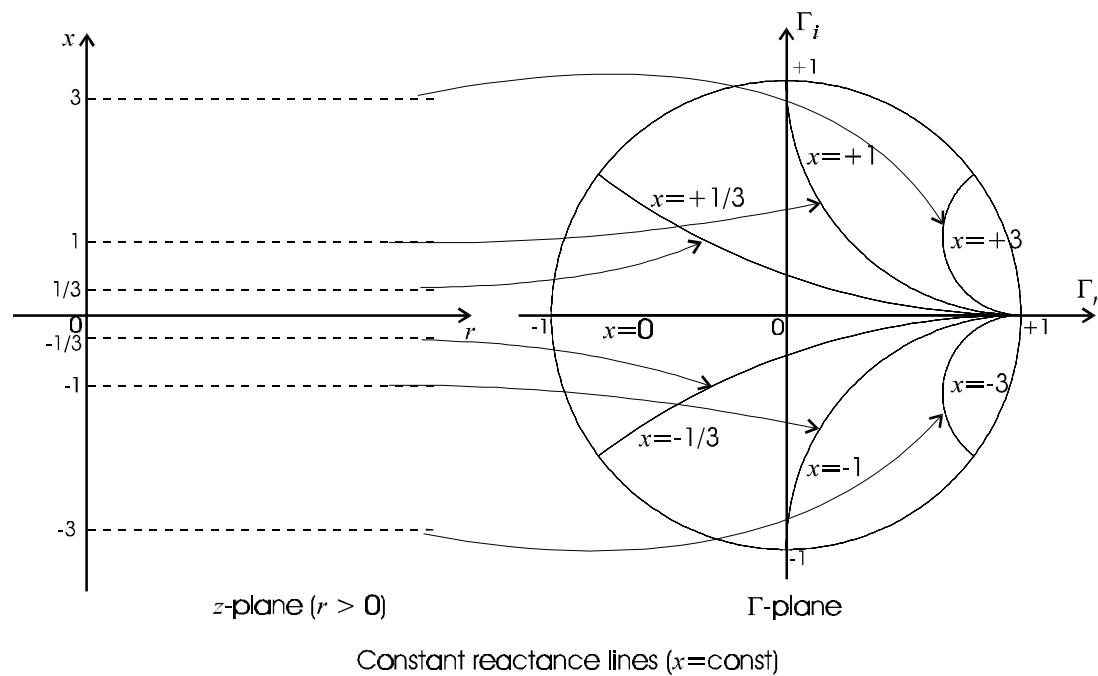
# Inversion of complex reflection coefficient (constant normalized resistance)

$$(\Gamma_r - \frac{r}{r+1})^2 + \Gamma_i^2 = \left(\frac{1}{r+1}\right)^2$$



# Inversion of complex reflection coefficient (constant normalized reactance)

$$(\Gamma_r - 1)^2 + (\Gamma_i - \frac{1}{x})^2 = \left(\frac{1}{x}\right)^2$$



# Combined display: Smith Chart

