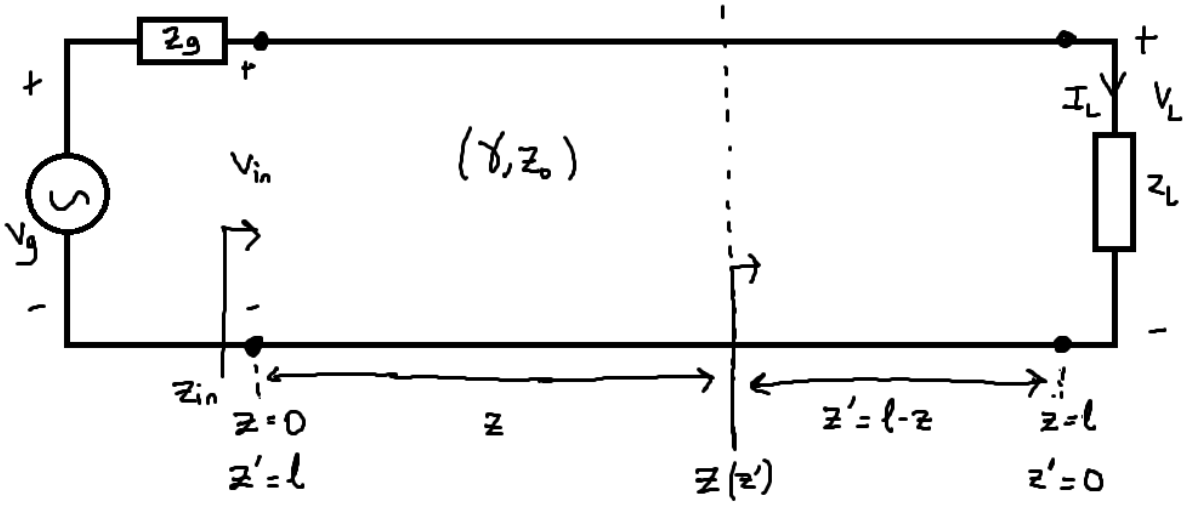
SMITH GRAFİĞİ
(SMITH CHART)



$$\underbrace{Z(z')}_{} = Z_0 \frac{Z_L + Z_0 \tanh(\gamma z')}{Z_0 + Z_L \tanh(\gamma z')} \quad (\Omega)$$

$-\infty, +\infty$ arasında
çok hızlı değişen bir fonksiyon

İletim hattı kayıpsız ise : $Z_i = R_0 \dfrac{Z_L + jR_0 \tan(\beta l)}{R_0 + jZ_L \tan(\beta l)} \quad (\Omega)$

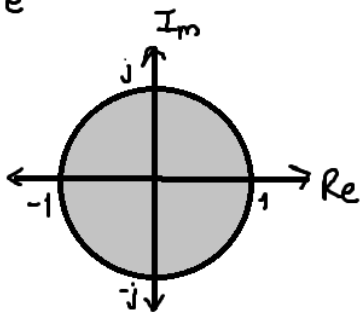
$\gamma = \alpha + j\beta = j\beta$ ve $\tanh(j\beta l) = j\tan(\beta l)$

kayıpsız iletim hattı için 0

Γ : yansıma katsayısı $|\Gamma| < 1$ olan daha müleyim bir fonksiyon

① Kayıpsız iletim hattında :

$$\Gamma\Big|_{\substack{z=l \\ z'=0}} = \frac{Z_L - R_0}{Z_L + R_0} = |\Gamma| e^{j\theta_\Gamma}$$



② Herşeyi Z_0'a (ya da R_0'a) göre

normalize ediyoruz :

$$\bar{Z}_L = \frac{Z_L}{Z_0} = \frac{Z_L}{R_0} = \frac{R_L}{R_0} + j\frac{X_L}{R_0} = r + jx \quad \text{(boyutsuz)}$$

r: normalize rezistans

x: normalize reaktans

Hatırlatma:

$Z = R + jX$

Z: empedans, R: rezistans, X: reaktans

$Y = G + jB$

Y: admitans, G: kondüktans, B: süseptans

$$\Gamma = \frac{Z_L - R_0}{Z_L + R_0} \Rightarrow \Gamma = \frac{\bar{z}_L - 1}{\bar{z}_L + 1} = \Gamma_r + j\Gamma_i$$

$$\Rightarrow \bar{z}_L = \frac{1+\Gamma}{1-\Gamma} = \frac{1+|\Gamma|e^{j\theta_\Gamma}}{1-|\Gamma|e^{j\theta_\Gamma}}$$

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

$$(1-\Gamma_r + j\Gamma_i)$$

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