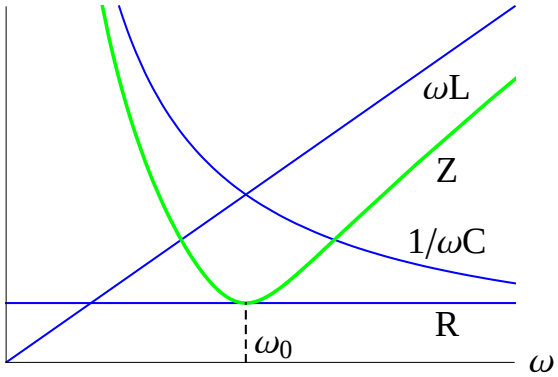
RLC Series Resonance (1)

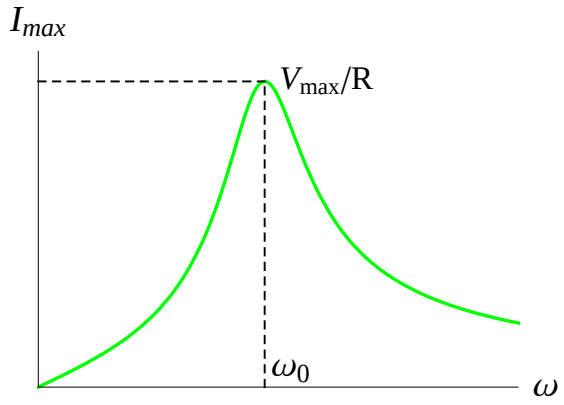
impedance

$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$



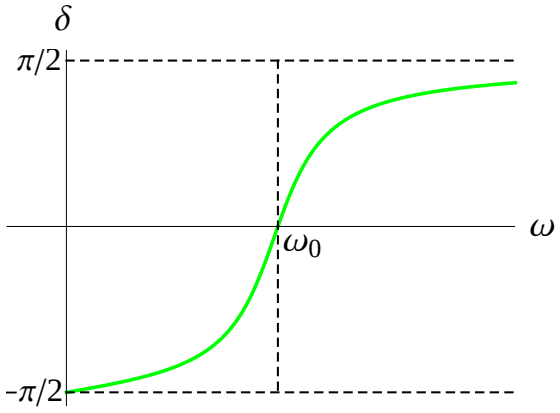
current

$$I_{max} = \frac{V_{max}}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$



phase angle

$$\delta = \frac{\omega L - 1/\omega C}{R}$$



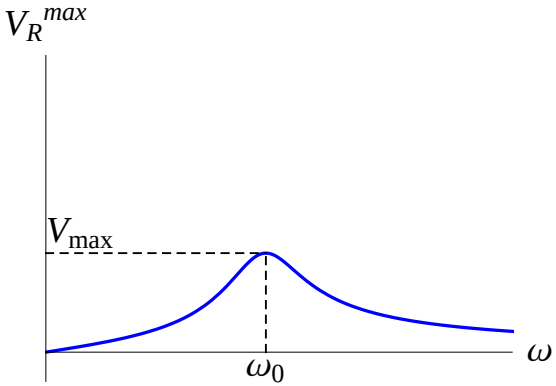
resonance angular frequency:

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

RLC Series Resonance (2)

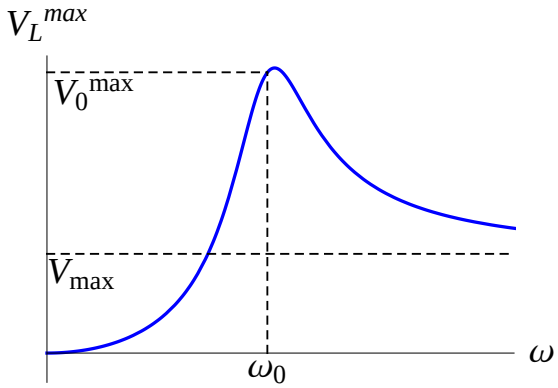
resistor

$$V_R^{max} = I_{max} R$$



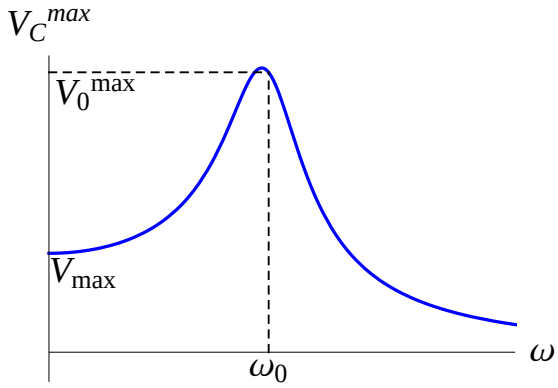
inductor

$$V_L^{max} = I_{max} \omega L$$



capacitor

$$V_C^{max} = I_{max} / \omega C$$



- relaxation times: $\tau_{RC} = RC, \quad \tau_{RL} = L/R$
- angular frequencies: $\omega_L = \dfrac{\omega_0}{\sqrt{1 - (\omega_0 \tau_{RC})^2/2}}, \quad \omega_C = \omega_0 \sqrt{1 - (\omega_0 \tau_{RC})^2/2}$
- voltages: $V_0^{max} = V_{max}\, \omega_0 \tau_{RL}, \quad V_L^{max}(\omega_L) = V_C^{max}(\omega_C) = \dfrac{V_0^{max}}{\sqrt{1 - (\omega_0 \tau_{RC})^2/4}}$