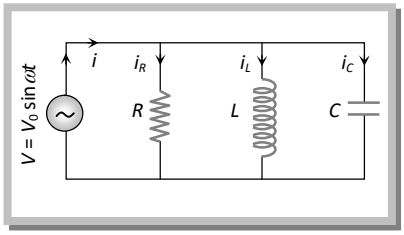
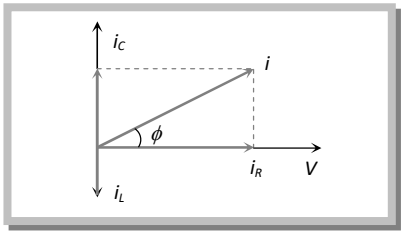
Parallel RLC Circuits.

$$i_R = \frac{V_0}{R} = V_0 G$$

$$i_L = \frac{V_0}{X_L} = V_0 S_L$$

$$i_C = \frac{V_0}{X_C} = V_0 S_C$$





(1) Current and phase difference

From phasor diagram current $i = \sqrt{i_R^2 + (i_C - i_L)^2}$ and phase difference

$$\phi = \tan^{-1}\frac{(i_C - i_L)}{i_R} = \tan^{-1}\frac{(S_C - S_L)}{G}$$

(2) Admittance (Y) of the circuit

From equation of current $\frac{V_0}{Z} = \sqrt{\left(\frac{V_0}{R}\right)^2 + \left(\frac{V_0}{X_L} - \frac{V_0}{X_C}\right)^2} \Rightarrow$

$$\frac{1}{Z} = Y = \sqrt{\left(\frac{1}{R}\right)^2 + \left(\frac{1}{X_L} - \frac{1}{X_C}\right)^2} = \sqrt{G^2 + (S_L - S_C)^2}$$

(3) Resonance

At resonance (i) $i_C = i_L \Rightarrow i_{\min} = i_R$ (ii) $\frac{V}{X_C} = \frac{V}{X_L} \Rightarrow S_C = S_L \Rightarrow \Sigma S = 0$

(iii) $Z_{\max} = \frac{V}{i_R} = R$ (iv) $\phi = 0 \Rightarrow$p.f. = cosϕ = 1 = maximum (v) Resonant frequency

$$\Rightarrow \nu = \frac{1}{2\pi\sqrt{LC}}$$

(4) Current resonance curve