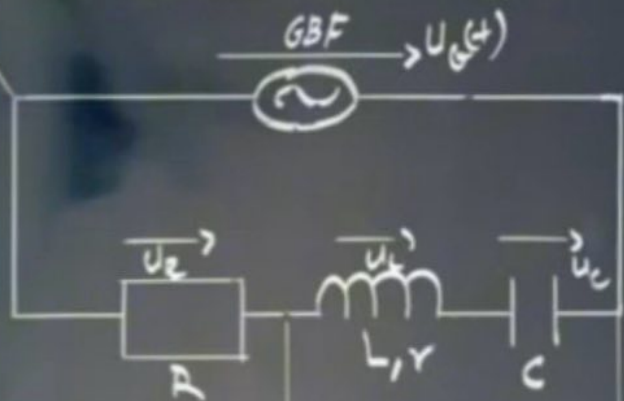


Synthèse physique

RL - RC - LC et RLC

Circuit RLC en série



$y_1 \rightarrow U_G(t)$

$y_2 \rightarrow U_R(t) \rightarrow i(t)$

(masse)

$U_{Gmax} = ?$

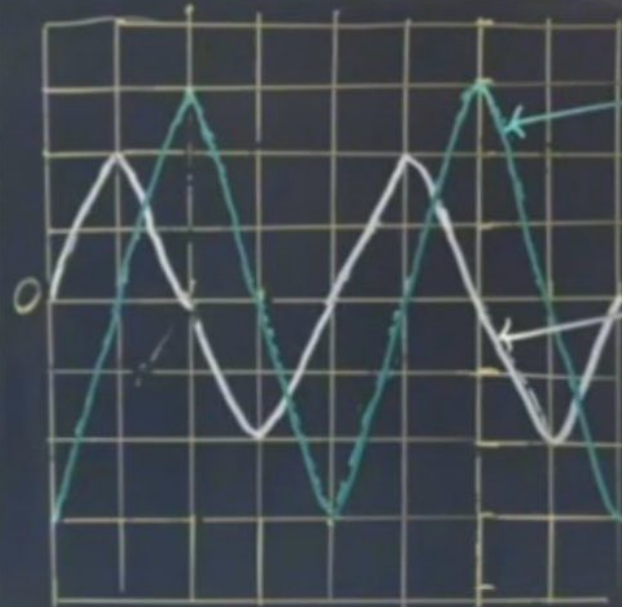
$I_m = ?$

$Z = ?$

$U_{eff} = ?$

$I_{eff} = ?$

ϕ



SV:

a: 1 div $\rightarrow$ 1V

b: 1 div $\rightarrow$ 1V

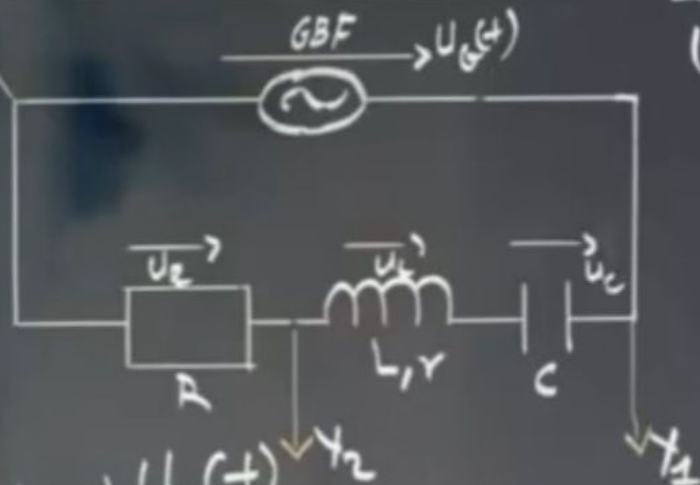
SH:

1 div $\rightarrow$ 1ms

Synthèse physique

RL - RC - LC et RLC

Circuit RLC en série

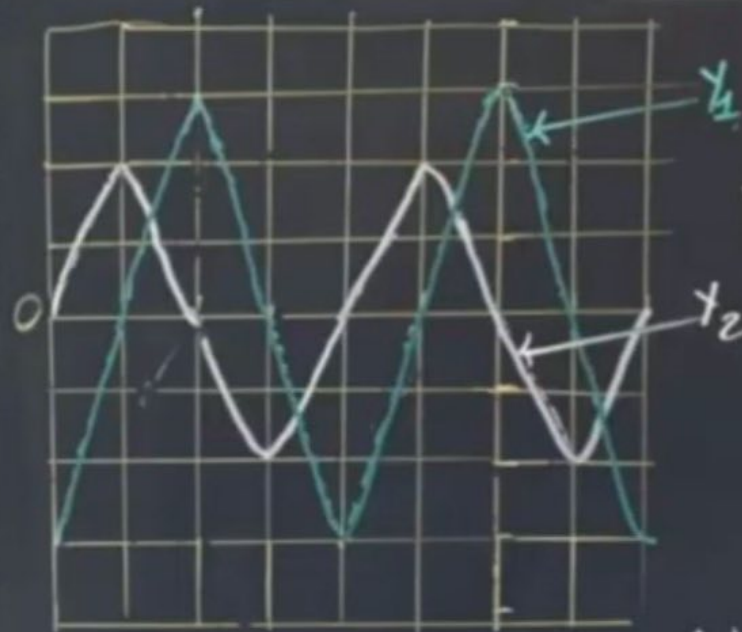


$y_1 \rightarrow U_G(t)$
 $y_2 \rightarrow U_R(t) \rightarrow i(t)$

(masse)

$U_{Gmax} = ?$ $U_{eff} = ?$
 $I_m = ?$ $I_{eff} = ?$
 $Z = ?$ $\phi = ?$

I
 U



SV:
 $y_1: 1 \text{ div} \rightarrow 1 \text{ V}$
 $y_2: 1 \text{ div} \rightarrow 1 \text{ V}$

SH:
 $1 \text{ div} \rightarrow 1 \text{ ms}$

$1 \text{ div} \rightarrow 1 \text{ V}$
 $3 \text{ div} \rightarrow U_{Gm}$

$$U_{Gmax} = 3 \times 1 = \underline{\underline{3 \text{ V}}}$$

$$U_{Rmax} = 2 \times 1 = \underline{\underline{2 \text{ V}}}$$

$R = 40 \Omega$

$$U_{Rmax} = R I_{max} \Rightarrow I_{max} = \frac{U_{Rmax}}{R}$$

$$I_{max} = \frac{2}{40} = \frac{1}{20} \text{ A}$$

$$U_{eff} = \frac{U_{max}}{\sqrt{2}} = \frac{3}{\sqrt{2}}$$

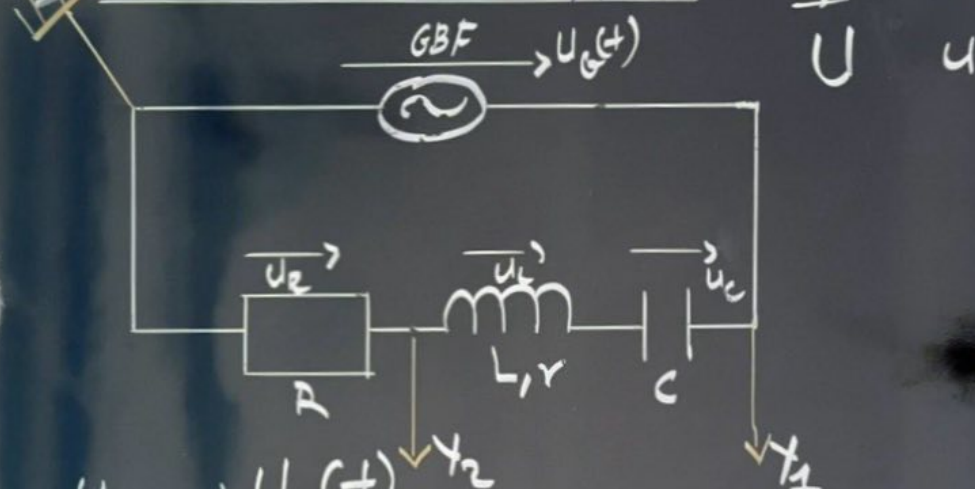
$$I_{eff} = \frac{I_m}{\sqrt{2}} = \frac{1}{20\sqrt{2}}$$

$$Z = \frac{U_{max}}{I_{max}}$$

Synthèse physique

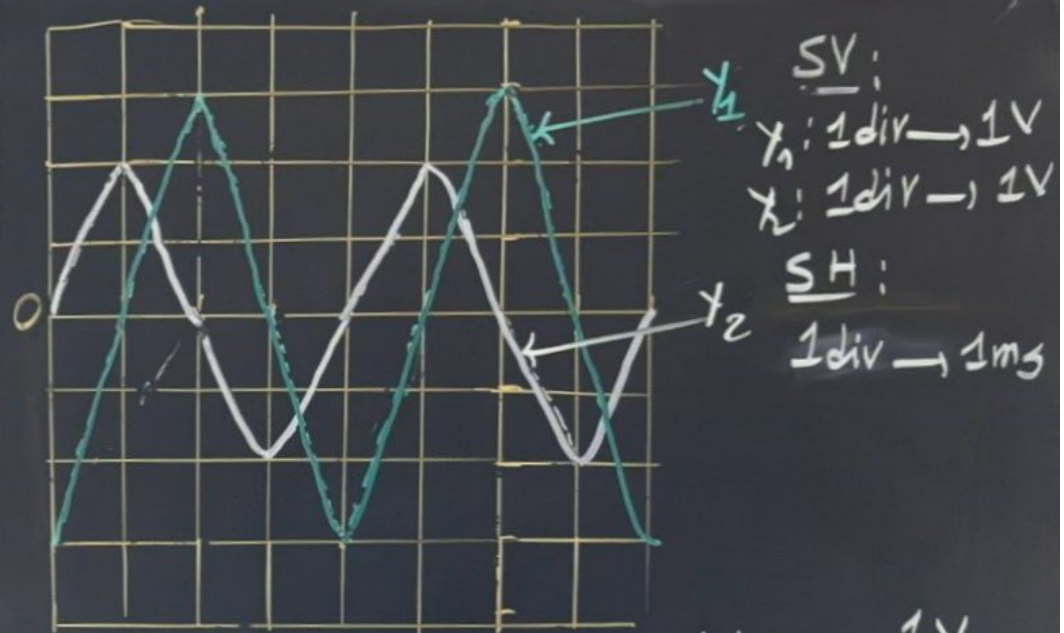
RL - RC - LC et RLC

Circuit RLC en série



$y_1 \rightarrow U_G(t)$
 $y_2 \rightarrow U_R(t) \rightarrow i(t)$
 (masse)

$U_{Gmax} = ?$ $U_{eff} = ?$
 $I_m = ?$ $I_{eff} = ?$
 $Z = ?$ $\phi = ?$



$SV:$
 $y_1: 1 \text{ div} \rightarrow 1V$
 $y_2: 1 \text{ div} \rightarrow 1V$

$SH:$
 $1 \text{ div} \rightarrow 1ms$

$1 \text{ div} \rightarrow 1V$
 $3 \text{ div} \rightarrow U_{Gm}$

$$U_{Gmax} = 3 \times 1 = \underline{\underline{3V}}$$

$$U_{Rmax} = 2 \times 1 = \underline{\underline{2V}}$$

$$R = 40\Omega$$

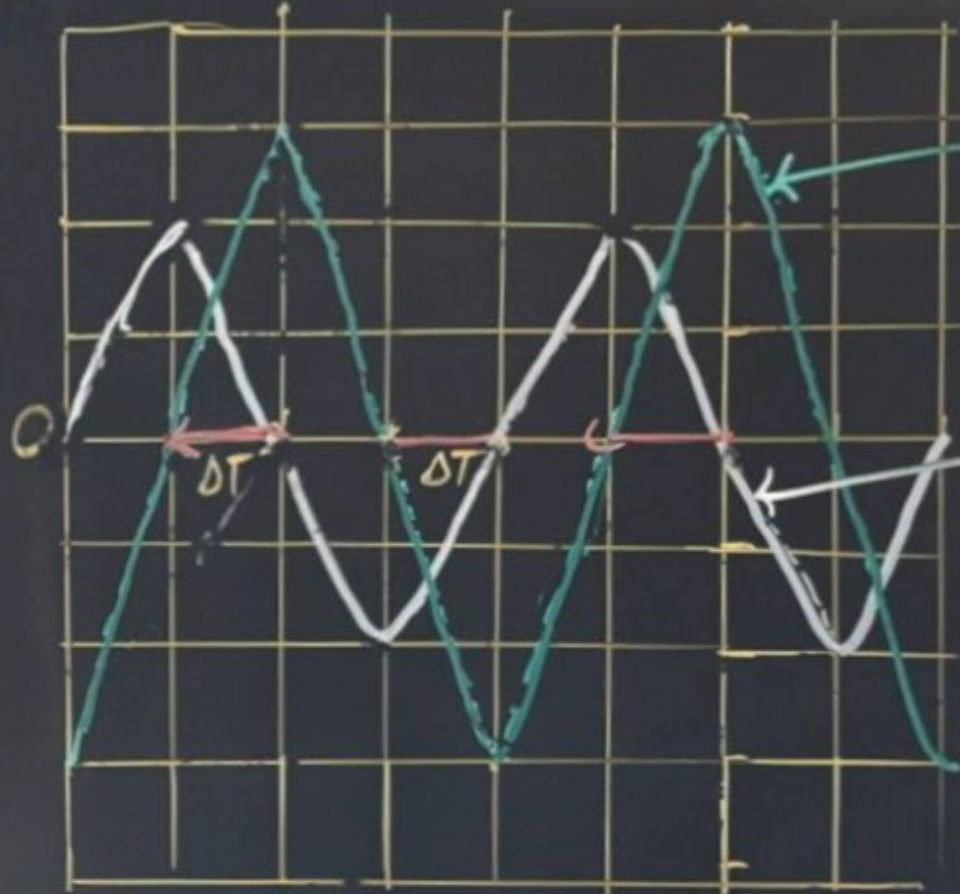
$$U_{Rmax} = R I_{max} \Rightarrow I_{max} = \frac{U_{Rmax}}{R}$$

$$I_{max} = \frac{2}{40} = \frac{1}{20} \text{ A}$$

$$U_{eff} = \frac{U_{max}}{\sqrt{2}} = \frac{3}{\sqrt{2}}$$

$$I_{eff} = \frac{I_m}{\sqrt{2}} = \frac{1}{20\sqrt{2}}$$

$$Z = \frac{U_{max}}{I_{max}}$$



SV:
 $x_1: 1 \text{ div} \rightarrow 1 \text{ V}$
 $x_2: 1 \text{ div} \rightarrow 1 \text{ V}$

SH:
 $1 \text{ div} \rightarrow 1 \text{ ms}$

instantane
par rapport U

$$\varphi = \left| \frac{2\pi}{T} \times \delta T \right|$$

$$T = 4 \times 1 = 4 \text{ ms}$$

$$\varphi = \left| \frac{2\pi}{4 \text{ div}} \times 1 \text{ div} \right| = \left| \frac{2\pi}{4} \right| = \left| \frac{\pi}{2} \right|$$

$$\boxed{\varphi = \left| \frac{\pi}{2} \right|}$$

$$\varphi_{i/u} = \varphi_i - \varphi_u = \frac{\pi}{2}$$

$$\varphi_{u/i} = \varphi_u - \varphi_i = -\frac{\pi}{2}$$

Synthèse physique

RL - RC - LC et RLC

circuit RLC en série

$$u(t) = ? \quad u(t) = U_m \cos(\omega t + \varphi_1)$$

$$i(t) = ? \quad i(t) = I_m \cos(\omega t + \varphi_2)$$

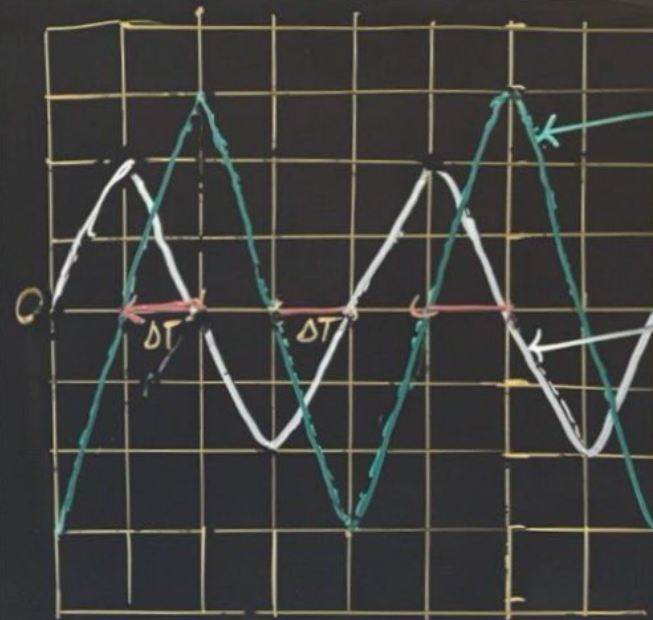
$$\omega = \frac{2\pi}{T}$$

$$i(t) = I_m \cos(\omega t + \frac{\pi}{2})$$

$$u(t) = U_m \cos(\omega t)$$

$$i(t) = I_m \cos(\omega t)$$

$$u(t) = U_m \cos(\omega t - \frac{\pi}{2})$$



SV:
 $Y_1: 1 \text{ div} \rightarrow 1 \text{ V}$
 $Y_2: 1 \text{ div} \rightarrow 1 \text{ V}$

SH:
 $1 \text{ div} \rightarrow 1 \text{ ms}$

distance
par rapport U

$$\varphi = \left| \frac{2\pi}{T} \times \Delta T \right|$$

$$T = 4 \times 1 = 4 \text{ ms}$$

$$\varphi = \left| \frac{2\pi}{4 \text{ div}} \times 1 \text{ div} \right| = \left| \frac{2\pi}{4} \right| = \left| \frac{\pi}{2} \right|$$

$$\varphi = \left| \frac{\pi}{2} \right|$$

$$\varphi_{i/u} = \varphi_i - \varphi_u = \frac{\pi}{2}$$

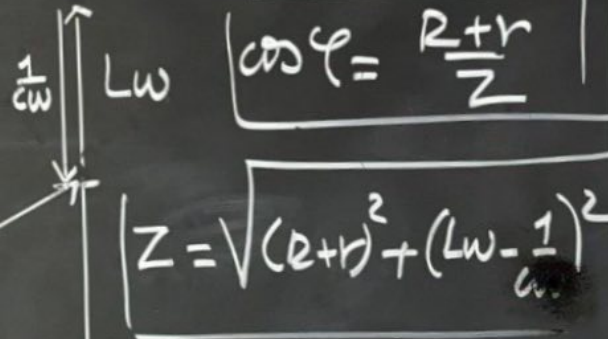
$$\varphi_{u/i} = \varphi_u - \varphi_i = -\frac{\pi}{2}$$

Synthèse physique

RL - RC - LC et RLC

circuit RLC en série

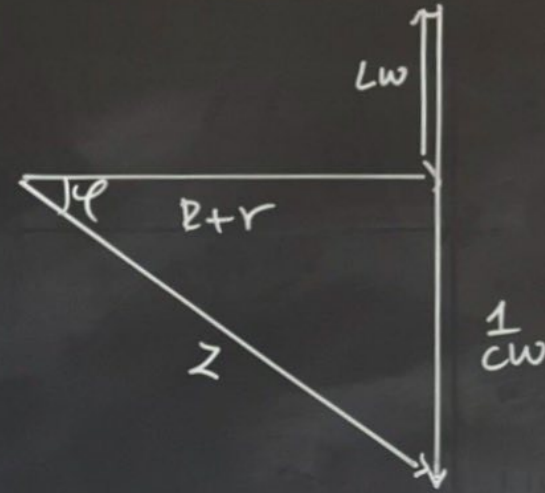
- circuit inductif: U est en avance sur i



$$\tan \varphi = \frac{L\omega - \frac{1}{C\omega}}{R+r}$$

$$L\omega > \frac{1}{C\omega}$$

- circuit capacitif: i est en avance sur U

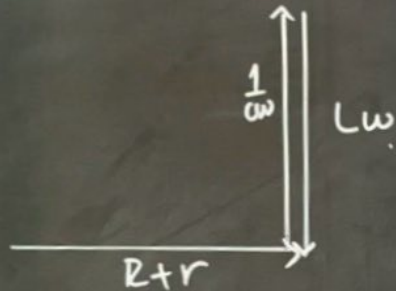


Synthèse physique

RL - RC - LC et RLC

circuit RLC en série

- circuit résistif: U et i sont ϕ phase:

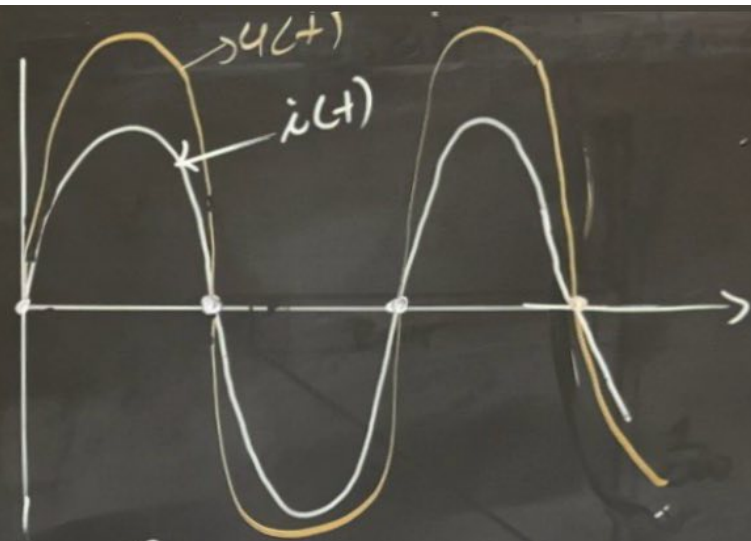


$$\cos \varphi = \frac{R+r}{Z}$$
$$\tan \varphi = \frac{L\omega - \frac{1}{C\omega}}{R+r}$$

à la résonance $\varphi = 0$

$$Z = R+r$$

$$L\omega = \frac{1}{C\omega} \Rightarrow \tan \varphi = 0$$



$$\varphi = 0$$
$$\varphi = \left| \frac{2\pi}{T} \times \frac{\Delta T}{0} \right|$$

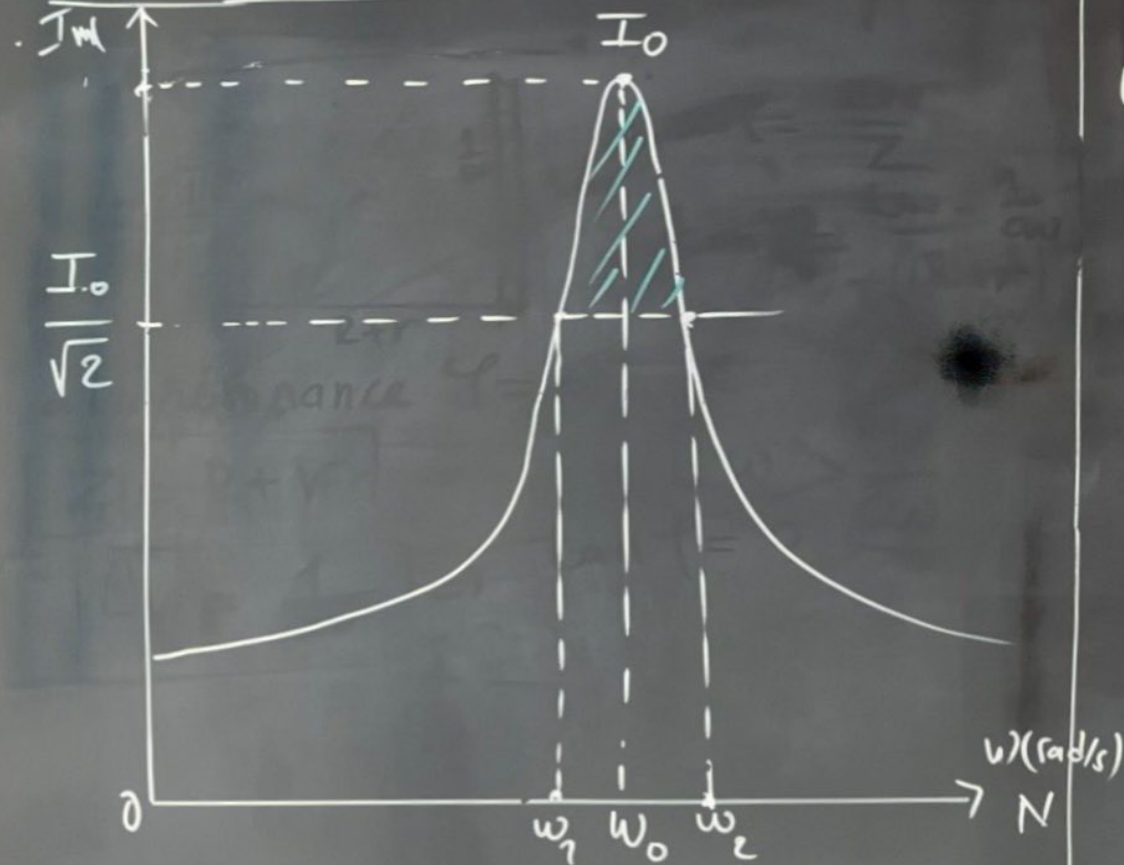
Synthèse physique

RL - RC - LC et RLC

circuit RLC en série

$$I_0 = 900 \text{ mA}$$

- Phénomène de résonance:



$$\varphi = 0$$

$$Z = R + r$$

$$L\omega = \frac{1}{C\omega} \Rightarrow LC\omega^2 = 1$$

$$I_{eff} = I_0 = \frac{U}{R}$$

Largeur de la bande passante:

$$\Delta\omega = \omega_2 - \omega_1$$

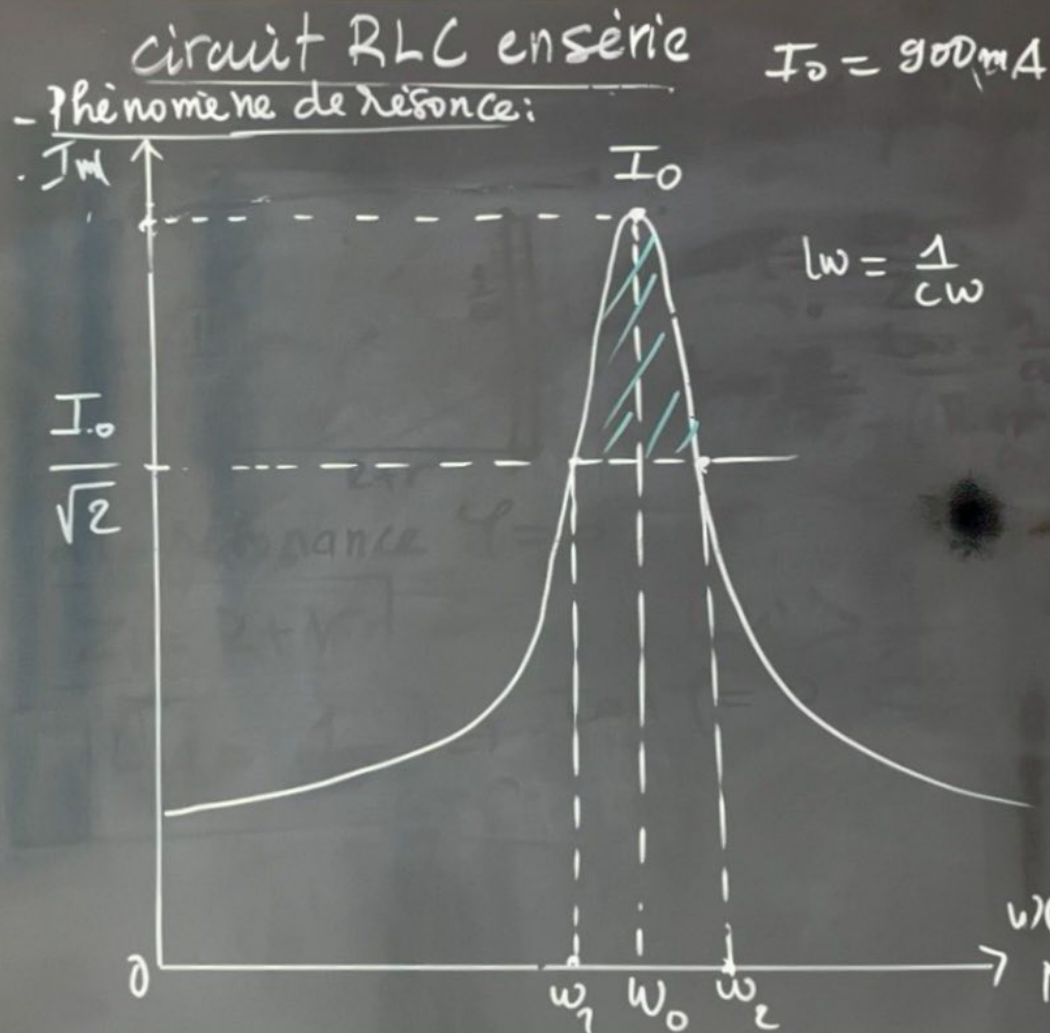
$$\Delta N = N_2 - N_1$$

$$\left| \Delta\omega = \frac{R_T}{L} \right|$$

$$\left| \Delta N = \frac{R_T}{2\pi L} \right|$$

Synthèse Physique

RL - RC - LC et RLC



$$P_{\text{moy}} = UI \cos \varphi$$

$$|P_a = UI|$$

$\cos \varphi$: facteur de puissance

$$|U_C = U_L|$$

$$|\Delta\omega = \frac{1}{L}|$$

$$|\Delta N = \frac{1}{2\pi L}|$$

Facteur de qualité Q

$$Q = \frac{\omega_0}{\Delta\omega} \text{ ou } Q = \frac{N_0}{\Delta N}$$

$$\Delta\omega = \frac{R}{L}$$

$$Q = \frac{L\omega_0}{R} = \frac{1}{R} \frac{1}{C\omega} = \frac{1}{RC\omega}$$