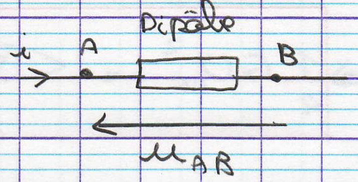
## V Puissance en RSF ⚠ cf POLYCOP !

**Définition :**




- $\mathcal{P} = \mathcal{P}(t) = u_{AB} \cdot i$ (puissance reçue)
- en moyenne, $\mathcal{P}_{reçue}$ :

$$\boxed{\langle \mathcal{P} \rangle = \frac{1}{T} \int_{t_0}^{t_0+T} \mathcal{P} \, dt}$$

en RSF :

$$\langle \mathcal{P} \rangle = \langle U_m \cos(\omega t + \varphi_u) \cdot I_m \cos(\omega t + \varphi_i) \rangle$$

$$= U_m I_m \langle \cos(\omega t + \varphi_u) \cos(\omega t + \varphi_i) \rangle$$

$$\langle \mathcal{P} \rangle = \frac{U_m I_m}{2} \langle \cos(2\omega t + \varphi_u + \varphi_i) + \cos(\varphi_u - \varphi_i) \rangle$$

$$= \frac{U_m I_m}{2} \left( \underbrace{\langle \cos(2\omega t + \varphi_u + \varphi_i) \rangle}_{0} + \underbrace{\langle \cos\varphi \rangle}_{= \cos\varphi} \right)$$

$$\boxed{\langle \mathcal{P} \rangle = \frac{U_m I_m}{2} \cos\varphi}$$

$$\boxed{\cos\varphi = \cos(\arg \underline{Z}) = \frac{R}{Z} = \frac{G}{Y}}$$

$$\underline{Z} = Z e^{j\varphi} = \underbrace{Z\cos\varphi}_{R} + j \underbrace{Z \sin\varphi}_{X} = R + jX \qquad \arg(\underline{Z}) = \varphi = \varphi_u - \varphi_i$$

$$\underline{Z} = \frac{1}{\underline{Y}} = Y e^{j\psi} = \frac{1}{Z} e^{-j\varphi} = G + jR \qquad \arg(\underline{Y}) = \psi = -\varphi$$

$$= Y\cos(-\varphi) + j Y \sin(-\varphi)$$

$$= Y \cos\varphi - j Y \sin\varphi$$

$$Z = |\underline{Z}| = \frac{U_m}{I_m} \qquad Y = \frac{I_m}{U_m}$$

$$\rightarrow \cos\varphi = \frac{R}{Z} = \frac{R I_m}{U_m} \qquad \rightarrow \boxed{\langle \mathcal{P} \rangle = \frac{1}{2} R I_m^2}$$

**Prop :** En moyenne L et C ne consomment aucune puissance : $\langle \mathcal{P}_L \rangle = \langle \mathcal{P}_C \rangle = 0$ car $R = 0$ pour L et C parfaits.

en RSF : $\langle \mathcal{P}_L \rangle = \langle \mathcal{P}_C \rangle = 0$

$$\cos\varphi = \frac{G}{Y} \Rightarrow \boxed{\frac{1}{2} G U_m^2 = \langle \mathcal{P} \rangle}$$

Déf d'une gdeur efficace

$$U_{eff} = \sqrt{\langle U_m^2 \cos^2(\omega t + \varphi_u) \rangle}$$

$$\boxed{G_{eff} = \sqrt{\langle g^2 \rangle}}$$

$$= \sqrt{U_m^2 \times \frac{1}{2}}$$

$$\langle \cos^2(\omega t + \varphi) \rangle = \frac{1}{2} = \langle \sin^2(\omega t + \varphi) \rangle$$

$$\boxed{U_{eff} = \frac{U_m}{\sqrt{2}}} \qquad \boxed{I_{eff} = \frac{I_m}{\sqrt{2}}}$$

Autres façons d'exprimer une tension ou une intensité sinusoïdale

$$\hookrightarrow u_{AB} = \underbrace{U_m}\cos(\omega t + \varphi_u)$$

$$= \underbrace{U_{eff}\sqrt{2}}\cos(\omega t + \varphi_u)$$

$$i = \underbrace{I_m}\cos(\omega t + \varphi_i)$$

$$= \underbrace{I_{eff}\sqrt{2}}\cos(\omega t + \varphi_i)$$

$$\boxed{\begin{aligned} \langle \mathcal{P} \rangle = \frac{U_m I_m}{2}\cos\varphi &= U_{eff} I_{eff} \cos\varphi \\ &= R I_{eff}^2 \\ &= G U_{eff}^2 \end{aligned}}$$

$\hookrightarrow$ cf POLYCOP §3 et §4 : à voir / travailler absolument