**33.6 Power in an AC Circuit**

In chapter 28, we found that the power delivered by a battery to an dc circuit equals to:

P=I2R=ΔV.I

Similarly, the power delivered by an ac generator to RLC circuit can be calculated as:

 $P=I.∆V=\left(I\_{max}sin\left(ωt-ϕ\right)\right).(∆V\_{max}sin\left(ωt\right))$

Also, we can express **the average power Pav.** as following:

 $P\_{av.}=\frac{1}{2}I\_{max}∆V\_{max}cos⁡(ϕ)=I\_{rms}∆V\_{rms}cos⁡(ϕ$)

Where: $cos⁡(ϕ$) is called the **power factor**.

**Special case:**

When $ϕ=0\rightarrow cos\_{(0)}=1$,

Then: $P\_{av.}=\frac{1}{2}I\_{max}∆V\_{max}=I\_{rms}∆V\_{rms}$

Moreover, we can write the average power as:

$$P\_{av.}=I\_{rms}^{2}R$$

We can conclude that:

* No power losses are associated with **pure capacitors and pure inductors** in an AC circuit. Why?
* The average power delivered by the source is converted to internal energy in the **resistor**.

**33.7 Resonance in a series RLC circuit**

In the RLC circuit, the resonance frequency occurs when the driving frequency is such that the rms current has its maximum value.

  33.14

**The angular frequency ω0 at which is called the resonance frequency of the circuit.**

  33.15

The average power as a function of frequency for a series RLC circuit as:

 $P\_{av. }=\frac{(∆V\_{rms})^{2}Rω^{2}}{R^{2}ω^{2 }+L^{2}(ω^{2}-ω\_{0}^{2})^{2}}$

* When ω=ω0, the average power is **maximum.**

The power factor Q can also be computed as following:

 $Q=\frac{ω\_{0}}{∆ω}=\frac{ω\_{0}L}{R}$