Analisi di un circuito RLC serie in regime sinusoidale

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Laboratorio di Elettromagnetismo e Ottica 18 Luglio, 2022

Presentazione

Apparato sperimentale
 Circuito
 Acquisizione e analisi
 Svolgimento

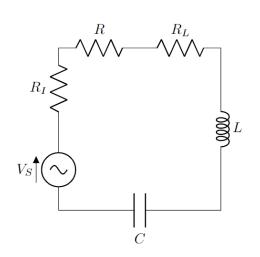
Risultati Studio qualitativo Analisi dell'ampiezza

Analisi della fase

3 Conclusioni

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Circuito



$$R_I = 50\Omega$$

$$\textit{R} = (330.0 \pm 0.3)\Omega$$

$$R_L = (34.5 \pm 0.1)\Omega$$

$$L = (10.3 \pm 0.1) mH$$

$$\textit{C} = (45.5 \pm 0.4) \textit{nF}$$

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Acquisizione e analisi



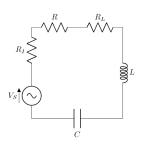
Scheda Elvis II

 Programma scritto in LabVIEW

 Dati elaborati con il softwere ROOT

Svolgimento

$$V(t) = V_0 \cos wt$$



$$i(t) = rac{V_0}{\sqrt{R^2 + (wL - rac{1}{wC})^2}}\cos\left[wt + \left(\arctanrac{1 - w^2LC}{wRC}
ight)
ight]$$

$$R(w) = rac{1}{1 + q^2(rac{w_0}{w} - rac{w}{w_0})} \quad q = rac{w_0 L}{R} = rac{1}{R} \sqrt{rac{L}{C}}$$

$$w_0 = \frac{1}{\sqrt{LC}}$$

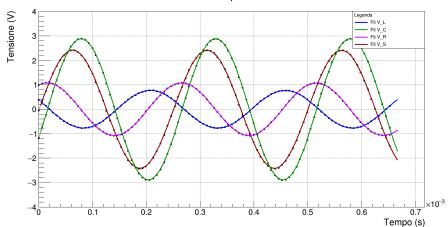
Nel caso del nostro circuito

$$q \approx 1.5$$
 $f_0 = (7351 \pm 68) Hz$



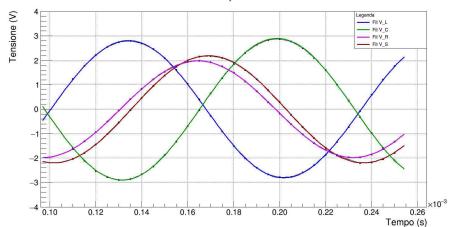
Studio qualitativo: 4000Hz

Tensione alla frequenza di 4000 Hz



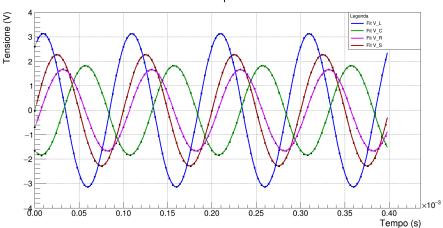
Studio qualitativo: f₀

Tensione alla frequenza di risonanza

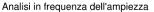


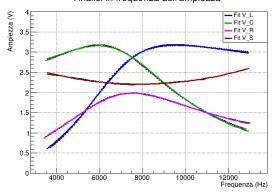
Studio qualitativo: 10000Hz

Tensione alla frequenza di 10000 Hz



Analisi dell'ampiezza





$$\textit{f}_0\textit{s} = (7562 \pm 5)\textit{Hz}$$

$$A_R(w) = rac{V_0 R}{\sqrt{R^2 + (wL - rac{1}{wC})^2}}$$

$$A_L(w) = \frac{V_0 wL}{\sqrt{R^2 + (wL - \frac{1}{wC})^2}}$$

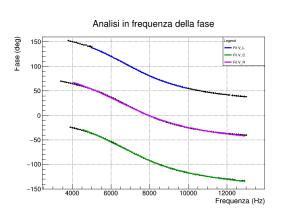
$$A_C(w) = \frac{\frac{V_0}{wC}}{\sqrt{R^2 + (wL - \frac{1}{wC})^2}}$$



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Analisi della fase



$$\Phi_R(w) = \arctan \frac{1 - w^2 LC}{wRC}$$

$$\Phi_L(w) = \arctan\left(\frac{1-w^2LC}{wRC}\right) + \frac{\pi}{2}$$

$$\Phi_{\it C}(\it w) = \arctan(rac{1-\it w^2LC}{\it wRC}) - rac{\pi}{2}$$

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Conclusioni: problematiche e possibili soluzioni

Definition

A prime number is a number that has exactly two divisors.

Example

- 2 is prime (two divisors: 1 and 2).
- 3 is prime (two divisors: 1 and 3).
- 4 is not prime (three divisors: 1, 2, and 4).

You can also use the theorem, lemma, proof and corollary environments.

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Analisi dati

Heading

- Statement
- 2 Explanation
- 3 Example

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The End

Questions? Comments?