جامعة محمد بوضياف- المسيلة -
Mohamed Boudiaf University at M'sila
كلية التكنولوجيا
Faculty of Technology
قسم الهندسة الكهربائية و قسم الإلكترونيك
Department of Electrical Engineering and Department of Electronics

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University year: 2024/2025 السنة الجامعية :2024 /2025
2nd year Electrical Engineering and Electronics السنة الثانية هندسة كهربائية و إلكترونيك
Applied Work in Electrical Measurement أعمال تطبيقية في القياسات الكهربائية

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PW n° 02: Inductance Measurement

Duration: 1^h30.

Date of the experiment: ……. /……../…….. .

Report prepared by:

Last Name	**First Name**	**Group**	**S/Group**	**Final Note**
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

Instructions :

- **Internal laboratory regulations must be observed.**
- **You must wear a lab coat.**
- **Attendance is compulsory and will be monitored. Any unjustified absence or failure to hand in a report will result in a mark of 0/20.**
- **Have your assemblies checked before connecting the voltage source.**
- **It is strictly forbidden to move equipment from one station to another. In the event of a breakdown or faulty equipment, contact the teacher.**
- **The report must be written by a maximum of four students.**
- **The report must be handed in at the beginning of the next session.**
- **The report must include the following sections:**
  - **TP cover page.**
  - **The date of the practical session.**
  - **Last Name and first name of the main writer.**
  - **Last Names and first names of the WP participants.**
  - **Preparation and work in manuscript.**

Person in charge of practical work: Dr. Abderrzak Laib

I. Aim of the manipulation

- Measure an inductance using the volt-amperometric and series RLC methods.
- Measure Quality factor

II. Equipment used

- Power Sources (DC).
- The Oscilloscope
- Function Generator (GBF)
- Electrical loads (resistors, inductors and capacitors).
- Measuring instruments (multimeters, ammeters, milliammeters, voltmeters, millivoltmeters).

III. Evaluation method

- Continuous assessment: 100%.

IV. Theoretical reminder:

A coil consists of a winding of conductive turns around an insulator. It therefore has a certain internal resistance due to the long length of wire. The coil is therefore symbolised in the receiver convention as follows:

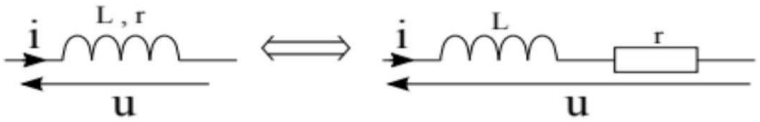

Figure 1: Symbolisation of a real coil, receiver convention.

V. Method n° 01: Indirect measurements using the Volt-Amperometric method

- Volt-Amperometric method with DC source
- Carry out the following assembly.

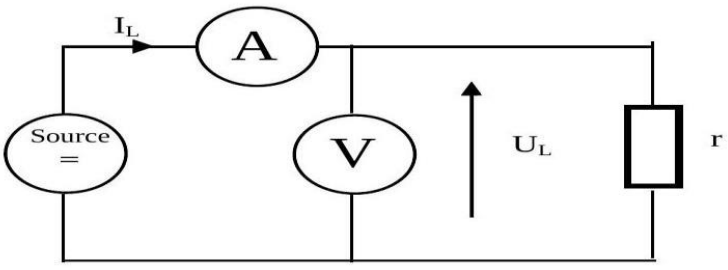

Figure 2: Volt-Amperometric method with DC source

- Find $\boldsymbol{U_L}$ and $\boldsymbol{I_L}$ by varying $\boldsymbol{U}$ from $1\boldsymbol{V}$ to $9\boldsymbol{V}$.

Person in charge of practical work: Dr. Abderrzak Laib

$\mathbf{U(V)}$	**1**	**3**	**5**	**7**	**9**
$\mathbf{U_L(V)}$					
$\mathbf{I_L(A)}$					
$\mathbf{Z = r = U_L/I_L}$					

Table 1

2) Volt-Amperometric method with AC source

- The coil is fed by a sinusoidal generator $\mathbf{U(t)}$ with an effective value $\mathbf{U(t) = 7V}$ and a variable frequency.
- Carry out the installation by positioning the equipment so that $\mathbf{U_L(V)}, \mathbf{I_L}$

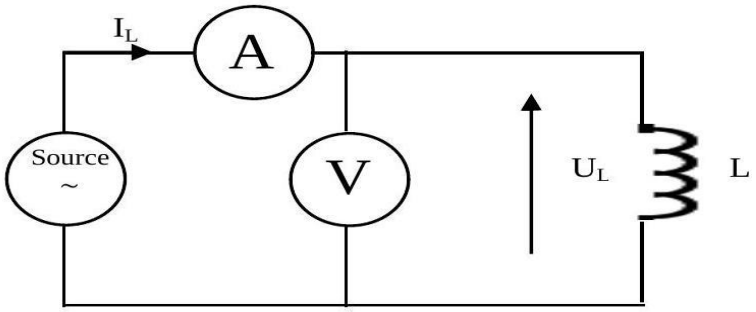

Figure 3: Volt-Amperometric method with AC source

- Find $\mathbf{U_L(V)}, \mathbf{I_L}$ by varying the frequency from **100 Hz** to **250 Hz**
- Calculate the value of **Z** from these measurements,
- Derive **L**

$\mathbf{f(Hz)}$	**100**	**150**	**200**	**250**
$\mathbf{U_L(V)}$				
$\mathbf{I_L(A)}$				
$\mathbf{Z = U_L/I_L}$				
L				

Table 2

VI. Method $n°02$: Indirect measurements using the Resonance of a series RLC circuit.

- The Resonance of a series RLC circuit

To study the resonance of the RLC circuit, we will make the following series circuit:

- An inductor set at $\mathbf{150mH}$
- A capacitor set at $\mathbf{3.3\mu F}$
- A resistor set at $\mathbf{560\Omega}$.

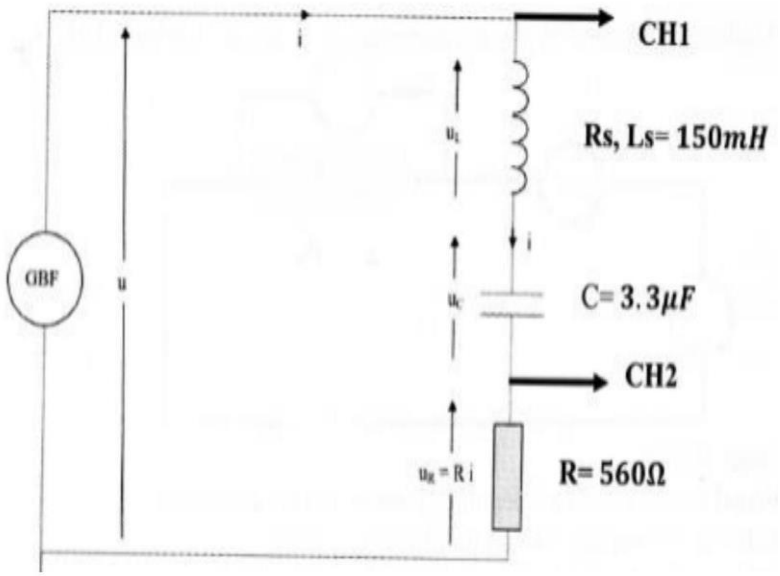

Figure 4: RLC circuit

- Look at the current and voltage curves on the oscilloscope. *
- Plot these curves on a millimetre sheet,
- Calculate the phase shift $\varphi_{\text{expérimental}}$ directly on the oscilloscope and compare it with the theoretical value.
- In general the impedance **Z** of a dipole is given by the relationship: $\mathbf{Z = U_{max}/I_{max} = U_{eff}/I_{eff} = U/I}$ through the dipole.
- Record the amplitude of the voltage across the resistor $\boldsymbol{U_R}$, the capacitor $\boldsymbol{U_C}$ and the coil $\boldsymbol{U_L}$ and the current I for frequencies between **100 Hz** and 500 **Hz**.
- Plot the curves $\boldsymbol{I, U_c, U_L, U_R = G(f)}$
- Calculate the resonance frequency
- Calculate the bandwidth and the quality factor, given that $\boldsymbol{Q = f_0/\Delta f}$
- Deduce the value of $\boldsymbol{L}$ for all frequencies;
- Discuss each of the results obtained.

$\mathbf{f(Hz)}$	**100**	**200**	f_0	**250**	500
$\mathbf{I(A)}$					
$\mathbf{U_R(V)}$					
$\mathbf{U_C}$(V)					
$\mathbf{U_L(V)}$					
$\mathbf{Z = U/I}$					
$\mathbf{R = U_R/I}$					
$\mathbf{Z_C = U_C/I}$					
$\mathbf{Z_L = U_L/I}$					
L					

Table 3

2) Interpretation of results

VII. Conclusion