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

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*University year: 2025/*2026 — السنة الجامعية : 2026/2025
2nd year Electrical Engineering — السنة الثانية هندسة كهربائية
Applied Work in Electrical and Electronic Measurements — أعمال تطبيقية في القياسات الكهربائية والإلكترونية

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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**
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-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

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: Pr ROUABHI.R

***PW n°02*: Inductance measurement**

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).

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:

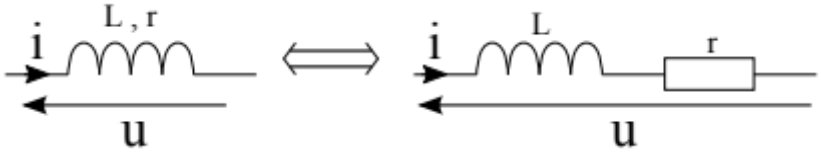


Figure 1: Symbolisation of a real coil, receiver convention

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

1) Volt-Amperometric method with DC source

- Carry out the following assembly.

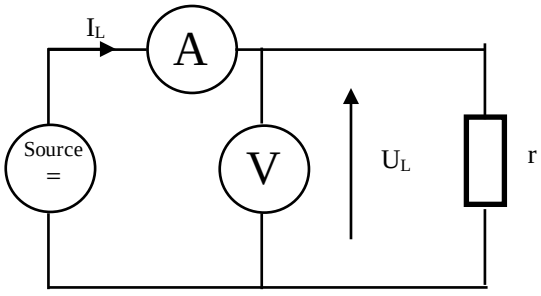


Figure 2: Volt-Amperometric method with DC source

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

U(V)	**1**	**3**	**5**	**7**	**9**
U_L(V)					
I_L(A)					
Z= r = U_L/ I_L					
r_{moy}					

Table 1

2) Volt-Amperometric method with AC source

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

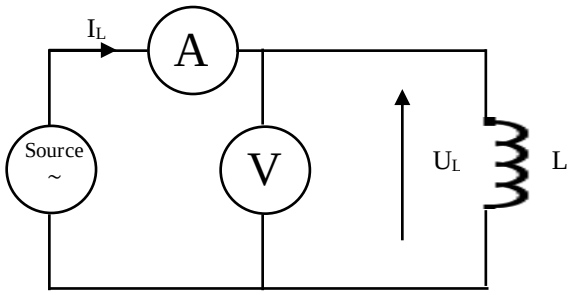


Figure 3: Volt-Amperometric method with AC source

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

f(Hz)	**100**	**150**	**200**	**250**
U_L(V)				
I_L(A)				
Z= U_L/ I_L				
L (mH)				

Table 2

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

1) 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 **150** $\boldsymbol{mH}$
- A capacitor set at $\boldsymbol{3.3\ \mu F}$
- A resistor set at **560 Ω.**

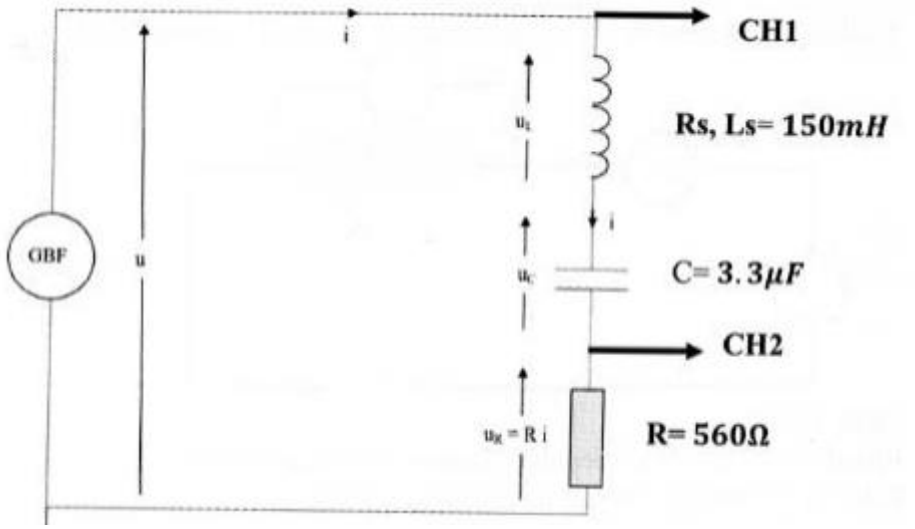
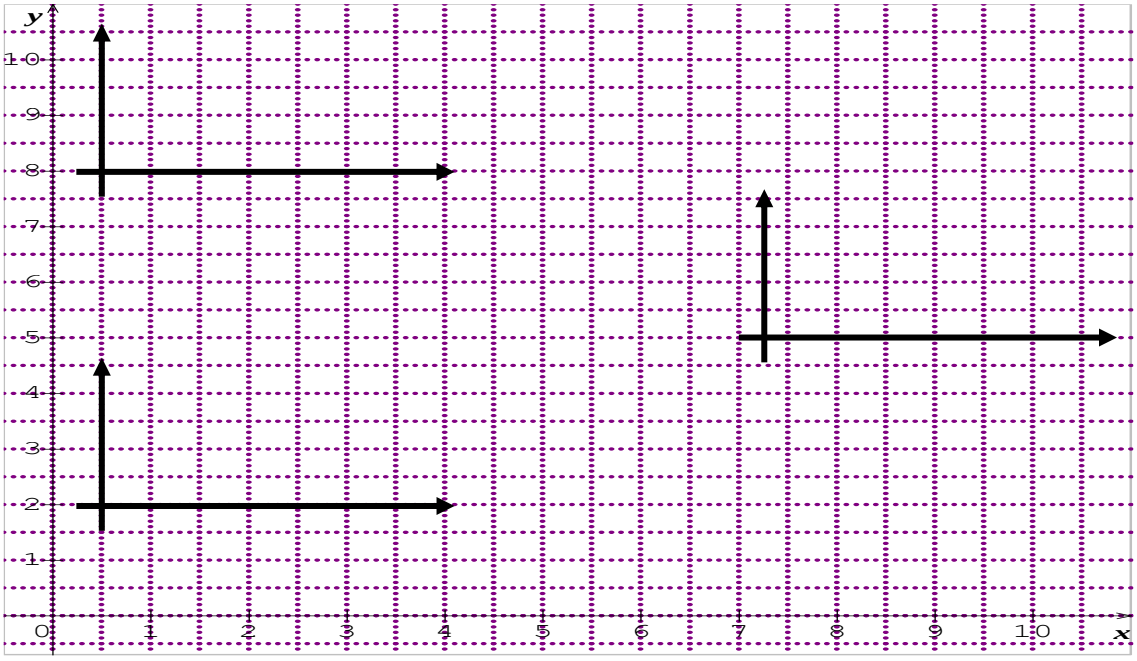


Figure 4: RLC circuit

- Look at the current and voltage curves on the oscilloscope.
- Plot these curves on a millimetre sheet for f=100; f=225; f=500.



- Calculate the phase shift $\varphi_{expérimental}$ directly on the oscilloscope and compare it with the theoretical value.

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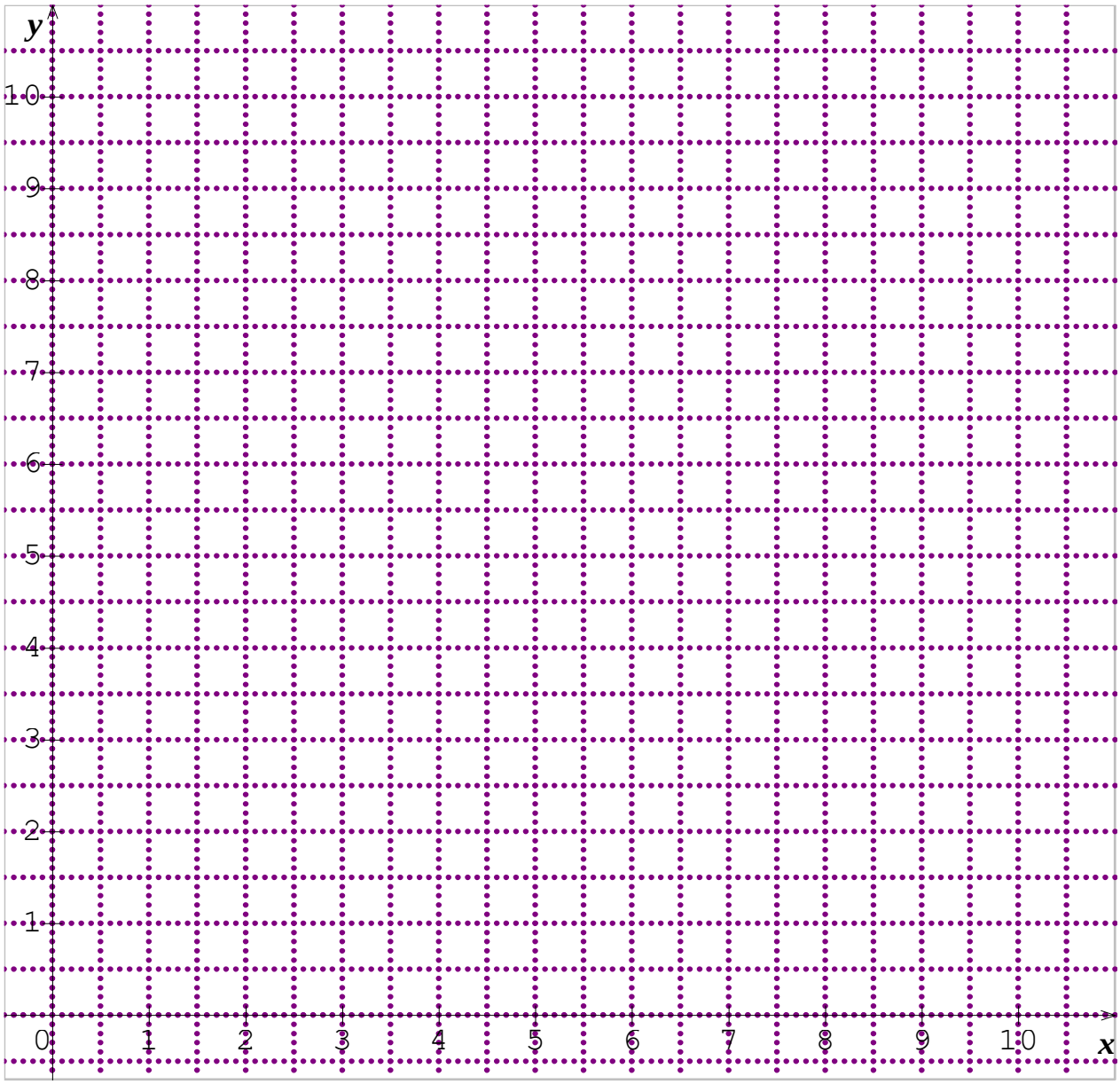
  In general the impedance **Z** of a dipole is given by the relationship: $\mathbf{Z = U_{max}/ I_{max} = U_{eff}/ I_{eff} = U/ I}$ through the dipole.

- 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 $\boldsymbol{I}$ for frequencies between **100 Hz** and **500 Hz.**
- Plot the curves $\boldsymbol{I}$, $\boldsymbol{U_c}$, $\boldsymbol{U_L}$, $\boldsymbol{U_R}$ = $\boldsymbol{G}$ ($\boldsymbol{f}$)



- Calculate the resonance frequency

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- Calculate the bandwidth and the quality factor, given that $Q = f_0/\Delta f$

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- Deduce the value of L for all frequencies;

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

Table 3

- Discuss each of the results obtained.

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VII. Conclusion

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