Lab n°: 4 The OSCILLOSCOPE

Measurement Of (Voltage, Frequency, Phase Shift)

1-Goals

- The objectives of this manipulation are: Getting started with an oscilloscope: Preliminary setup, start up, visualization and
- Measurements on alternative signals (Amplitude, frequency and phase shift).
- Introduction of a Base Frequency Generator (GBF) and a stabilized Power supply.
- Handling of a multimeter: different measurements (voltage, current, resistance)

2- MANIPULATIONS

- Preliminary setup and start of oscilloscope
  a- Before turning on the oscilloscope, it is recommended to make the following adjustments:
    - Check that all keys are out.
    - Check that the TIME/DIV database rotary buttons, and variable attenuators
    - VOLTS/DIV and are in calibrated position (in right-hand stop).
    - Check that the HOLD OFF control is in calibrated position (left stop).
    - Set the shift controls: X-POS, Y-POS. I and Y-POS.II, to the middle position
    - (mark pointing up).
    - The TRIG. trigger selector must be in the highest position (AC).
    - Both GD and two-way keys are pressed (input signal is grounded).

  b- Once the oscilloscope is turned on by pressing the red POWER button, the LED lights up and a trace representing the baseline on track I (or track II) will appear after a few seconds.
    - To set the signal to channel I (or channel II), press the CHI/II button.
    - To display signals on both channels, press the DUAL key.
    - Place this line in the center of the screen by X-POS and Y.POS I/Y.POS II controls.
    - Adjust the beam intensity and astigmatism by INTENS. and FOCUS controls for
    - Obtain a trace of medium intensity with optimum fineness.
    - If no trace appears, check the position of other keys, especially the AT/NORM key that should be output.

- **Voltage, frequency and phase shift measurements:**
- **voltage measurements**

Using a GBF, apply a sinusoidal voltage to the input of channel I of the oscilloscope and select the caliber that is suitable for correct visualization of the signal.

 Measure the amplitude c-to-c of this signal

 Measure the voltage using a multimeter.

 Carry these values into Table No. 1 and repeat the same work for a triangular signal and a square signal.

Table No 1:

			
Rang oscillo (V/cm)			
Nbre of cm (c-to-c)			
$V_{c\text{-}t\text{-}c}$ (V)			
V_{max}			
$V_{(multi)}$			
V_{eff}			

Frequency measurements

Using a GBF, apply a sinusoidal signal with a frequency greater than 100 Hz to the input of channel I and the oscilloscope and select the calibers which are suitable for correct visualization of the signal.

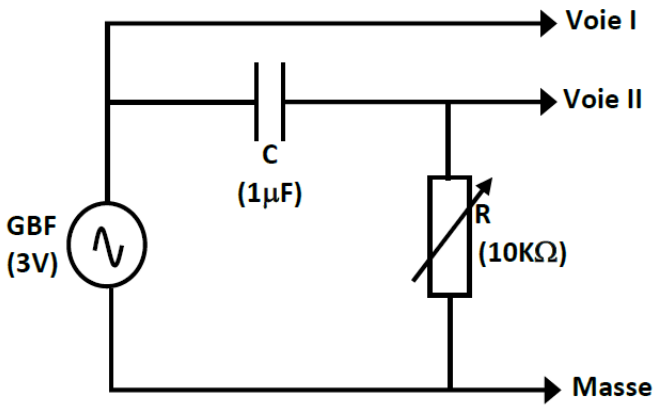
- Measure the period of this signal and enter these values in table No. 2
- Repeat the same work for a triangular signal and a square signal

Table No 2:

			
Freq GBF (Hz)			
Temp/Rang (ms/cm)			
Nbre of cm (for T)			
T(s)			
f=1/T (Hz)			

- **Phase shift measurements**
- **Direct method:**

1. Perform the following assembly :



2. Check that the GD keys are pressed (input signal is grounded), then adjust the two traces of the oscilloscope so that they are perfectly superimposed on the x-axis.
3. Vary the resistance R and determine the phase shift for each value of R.
4. Enter these values in table No. 3

Table No 3:

R (KΩ)	1	2	4	8	10
t (cm)					
T (cm)					
φ = t/T X 360°					

Lissajous's method:

Two signals of the same frequency

1.Set the oscilloscope to horizontal scan by pressing X-Y.
2. Press the GD keys on both lanes and fix the spot in the middle of the axes (center).
3. For the same assembly, determine the phase shift for each value of R.
4. Enter these values in table N°4

Table No 4:

R (KΩ)	1	2	4	8	10
a (cm)					
b (cm)					
a/b					
sin φ = a/b					
φ = arcsin a/b (rd)					
φ (degré °)					

Two signals of different frequencies

1. Set the oscilloscope to horizontal scan by pressing the Hor.ext button.
2. Press the GD keys on both lanes and fix the spot in the middle of the axes (center).
3. Apply the signal from GBF1 to channel I and the signal from GBF2 to channel II.
4. Vary the frequency of GBF2 according to table N°5 until a stable figure is obtained on the oscilloscope screen.
5. Read Nx and Ny and enter these values in table N°5

Table N°5:

Fréq. GBF(Hz)	75	100	150	200
Nx				
Ny				
Nx / Ny				
Fx = Fo . Nx / Ny				