VERIFICATION OF OHM'S LAW USING BREAD-BOARD

LAB # 04

Spring 2023

CSE103L Circuits & Systems-I Lab

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Section: **B**

"On my honor, as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work."

Student Signature: _____

Submitted to:

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OHM'S LAW:

Statement: *"In electrical circuit current is directly proportional to applied voltage of resistance remain unchanged."*

Explanation:

Ohm's law is a fundamental principle in electrical engineering that describes the relationship between voltage, current, and resistance in an electrical circuit. The law states that the current flowing through a conductor between two points is directly proportional to the voltage across the two points, and inversely proportional to the resistance between them. In mathematical form, Ohm's law can be expressed as

$$V = I \times R$$

here

I = Current (measured in Amperes, or A)

V = Voltage (measured in Volts, or V)

R = Resistance (measured in Ohms, or Ω)

MATHEMATICALLY:

$$I \alpha V \quad => \quad I = 1/R * V$$

$$V = IR \quad => \quad R = V/I$$

OBJECTIVE OF THE LAB:

I. We will be able to recognize current as the rate at which charge flows past a point, identify the units for electric current, and perform simple computations regarding electric current.

II. We will be able to identify the definition of voltage, the units of voltage, and relate voltage to the electric potential difference between two points on a circuit.

APPARATUS:

A breadboard

A DC power supply

A digital multimeter (DMM)

Resistors of different values

Connecting wires

PROCEDURE:

1) Place the breadboard on a flat surface and insert the resistor into the breadboard.
2) Connect the positive lead of the DMM to the positive rail of the breadboard and the negative lead to the negative rail.
3) Turn on the DMM and set it to the resistance measurement mode (Ω).
4) Place the leads of the DMM on either side of the resistor.
5) Read the resistance measurement displayed on the DMM.
6) Calculate the current (I) by applying Ohm's Law: I = V/R, where V is the voltage applied across the resistor and R is the resistance of the resistor. In this case, since we have a fixed resistor value, we will use the resistance value measured in step 5.
7) Apply a voltage to the breadboard using a power supply or battery. For example, use a 9V battery and connect the positive terminal to one end of the resistor and the negative terminal to the other end.
8) Measure the voltage (V) across the resistor using the DMM by placing the leads on either side of the resistor.
9) Calculate the current (I) using Ohm's Law: I = V/R, where V is the voltage measured in step 8 and R is the resistance value measured in step 5.

10) Compare the calculated current from step 6 with the calculated current from step 9. They should be equal if Ohm's Law is valid.

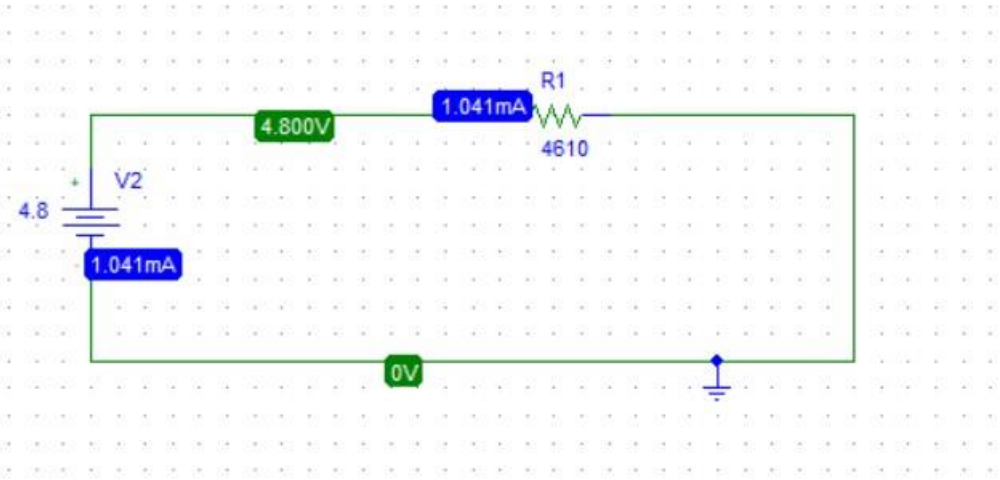


Fig #3 general setup for verification of ohm law

Precaution:

We have to make sure to use the correct units when calculating the current, voltage, and resistance. In this case, use volts (v) for voltage, ohms (ω) for resistance, and amperes (a) for current.

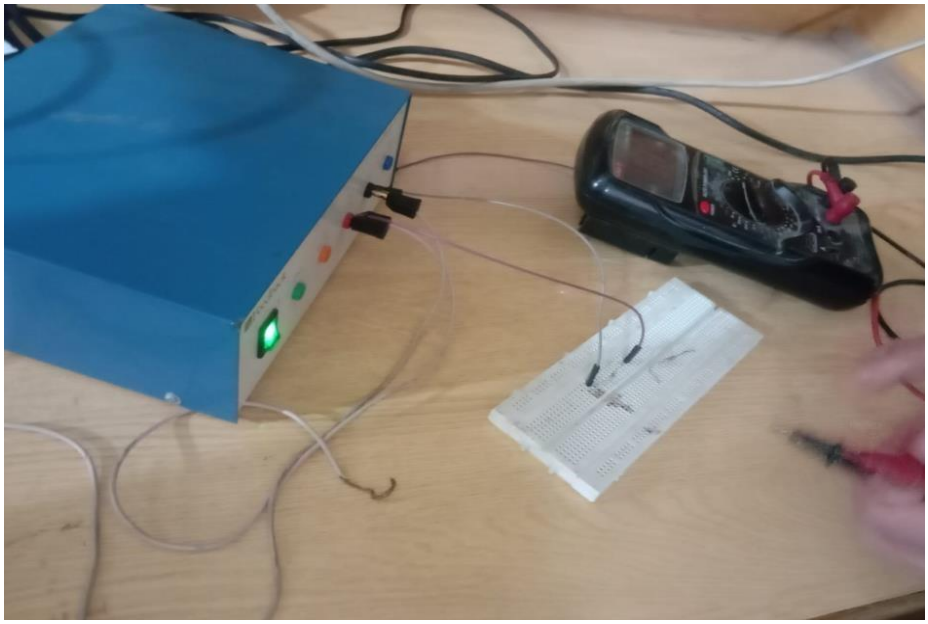


Fig no 1 experimental setup

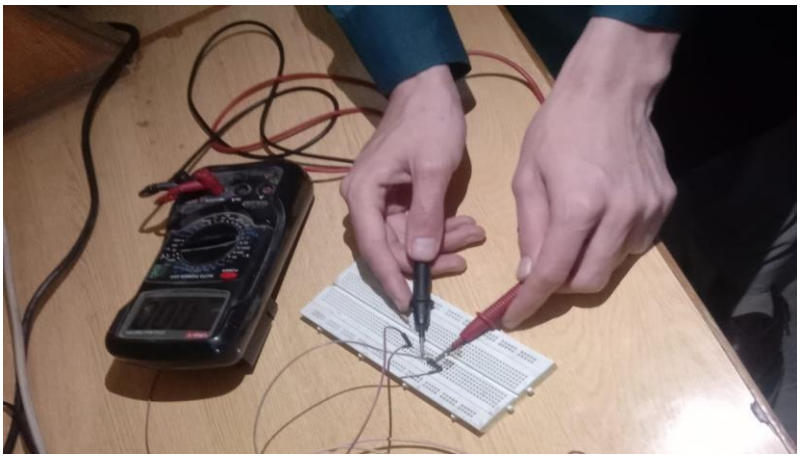
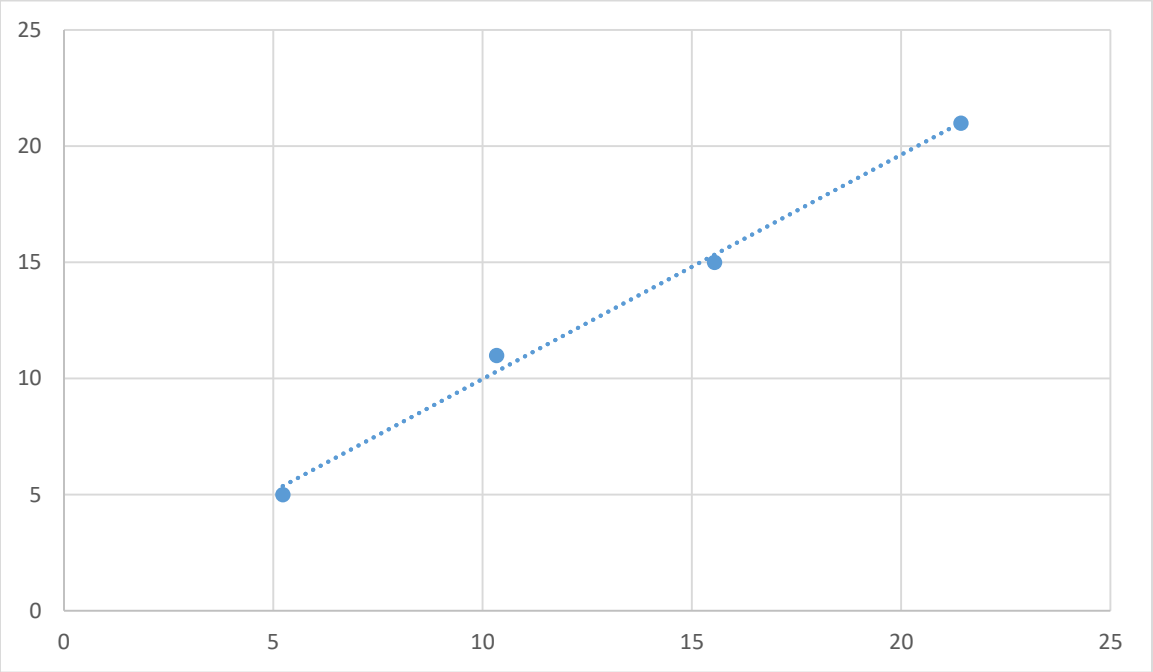


Fig no 2 measuring voltage through multimeter

GRAPH



Here x-axis shown voltage and y-axis CURRENT.

OBSERVATION AND CALCULATION

S no	Measured voltage(V)	Resistance (Ω)	Current(A) I=V/R
1	5.23	22k	5.23mA
2	9.96	22k	10.343mA
3	15.22	22k	15.349 mA
4	25.04	22k	25.545mA

ANALYSIS:

Verification of Ohm's Law on a breadboard using a DMM (Digital Multimeter) involves conducting an experiment to confirm the relationship between voltage, current, and resistance, as described by Ohm's Law. Ohm's Law states that the current flowing through a conductor is directly proportional to the voltage applied

across it, and inversely proportional to its resistance. To perform this experiment, we will need a breadboard, a resistor of known value, jumper wires, and a DMM. The steps involved in the experiment are as follows:

First, connect the breadboard to the DMM using jumper wires. The red wire should be connected to the positive (red) probe of the DMM, and the black wire to the negative (black) probe of the DMM. Next, insert the resistor into the breadboard. The resistor should be placed between two columns on the breadboard, and its legs should be inserted into the breadboard's holes.

Use jumper wires to connect the resistor to the breadboard's power rails. One end of the resistor should be connected to the positive power rail, and the other end to the negative power rail. Set the DMM to measure DC voltage (VDC). Touch the probes of the DMM to the power rails on the breadboard to measure the voltage across the resistor.

Record the voltage reading displayed on the DMM. This is the voltage (V) applied across the resistor. Next, set the DMM to measure DC current (ADC). Disconnect one of the jumper wires connecting the resistor to the power rail, and insert the red probe of the DMM between the resistor and the disconnected jumper wire. Insert the black probe of the DMM into the negative power rail.

Reconnect the jumper wire to the power rail. Record the current reading displayed on the DMM. This is the current (I) flowing through the resistor.

Finally, calculate the resistance (R) of the resistor using Ohm's Law: $R = V/I$.

Compare the calculated resistance value with the known value of the resistor used in the experiment. If the calculated resistance value is close to the known value of the resistor, then the experiment has verified Ohm's Law on the breadboard using a DMM. If there is a significant difference between the calculated and known resistance values, then there may be errors in the experiment, such as inaccurate measurements or incorrect connections.

Overall, verifying Ohm's Law on a breadboard using a DMM is a simple yet effective experiment that allows us to confirm the relationship between voltage,

current, and resistance described by Ohm's Law. This experiment is commonly performed in introductory electronics courses to teach students about the basic principles of electricity and circuit analysis.

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LAB RUBRICS: (Circuits & Systems-I Lab)

Criteria & Point Assigned	Outstanding 4	Acceptable 3	Considerable 2	Below Expectations 1
Attendance and Attentiveness in Lab PLO10	Attended in proper Time and attentive in Lab	Attended in proper Time but not attentive in Lab	Attended late but attentive in Lab	Attended late not attentive in Lab
Equipment / Instruments Selection and Operation PLO1, PLO2, PLO3, PLO5,	Right selection and operation of appropriate equipment and instruments to perform experiment.	Right selection of appropriate equipment and instruments to perform experiment but with minor issues in operation	Needs guidance for right selection of appropriate equipment and instruments to perform experiment and to overcome errors in operation	Cannot appropriately select and operate equipment and instruments to perform experiment.
Result or Output/ Completion of target in Lab PLO9,	100% target has been completed and well formatted.	75% target has been completed and well formatted.	50% target has been completed but not well formatted.	None of the outputs are correct
Overall, Knowledge PLO10,	Demonstrates excellent knowledge of lab	Demonstrates good knowledge of lab	Has partial idea about the Lab and procedure followed	Has poor idea about the Lab and procedure followed
Attention to Lab Report PLO4,	Submission of Lab Report in Proper Time i.e. in next day of lab., with proper documentation.	Submission of Lab Report in proper time but not with proper documentation.	Late Submission with proper documentation.	Late Submission Very poor documentation