Lab no. 1: Ohm's Law (example lab report)

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Mission:

This lab investigates Ohm's Law through measurement. Experimentally, by measuring the voltage drop and current magnitude through the resistor, Ohm's law is studied. The measurement results are compared with the expected theoretical equation.

Introduction:

In experimental studies conducted by Ohm, the German physicist, he concluded that the current magnitude that runs through materials by the effect of an external electrical source that is also called electromotive force (EMF), is proportional to the applied voltage. The ratio of the EMF or voltage to the measured current magnitude is constant and depends on the material under test. This ratio is called the resistance of that material. In other words:

$$R = \frac{V}{I}$$

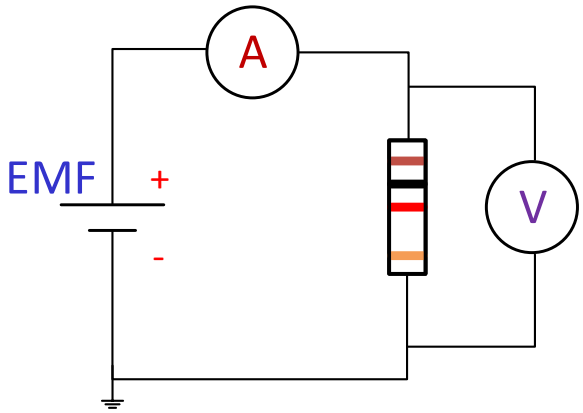

Figure 1: Schematic of measurement in investigation of Ohm's Law

Measurement Procedure:

In this experiment, first the circuit is assembled on breadboard, as it is illustrated in Figure 2.

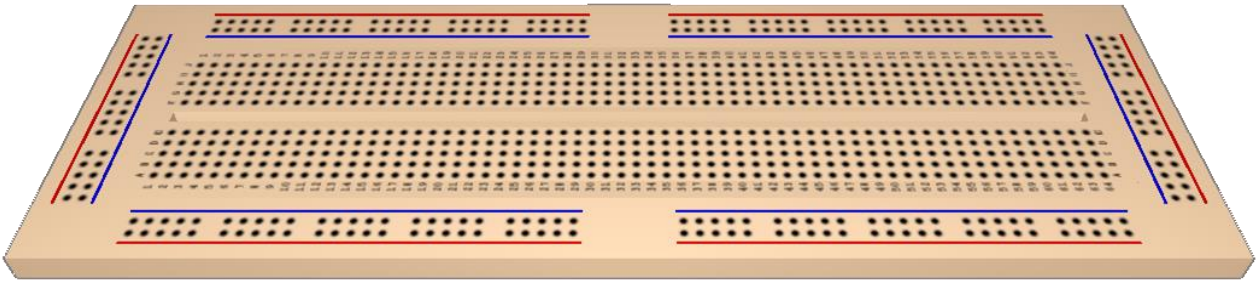

Figure 2: Breadboard

Among the under test resistors, at first the circuit is built for a 100 Ω resistor. After assembling the circuit on breadboard, it looks like the schematic of the Figure 3. The blue boxes illustrate the voltmeter and ammeter. (You may paste the picture of your circuit that you take with your camera.)

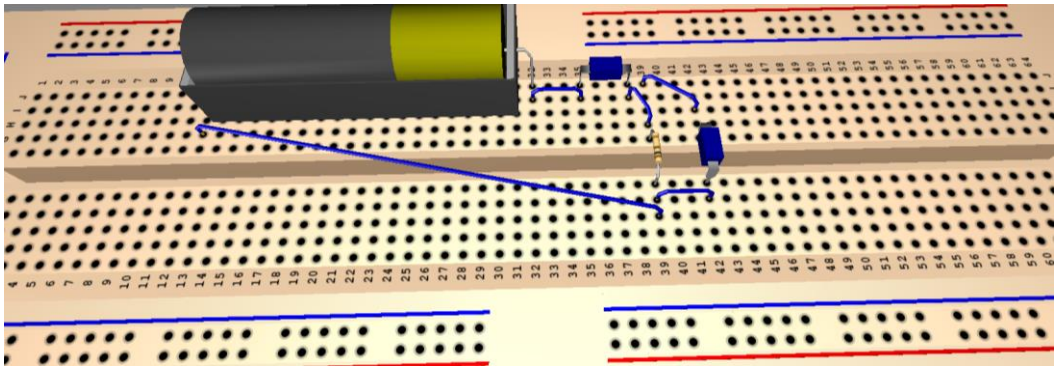

Figure 3: Assembled circuit on breadboard

Steps of measurement:

After assembling the circuit:

1. The voltage of the DC source (power supply) is set to 1 V. Then the voltage across the resistor and the current through the circuit are measured using connected meters.
2. The voltage across the DC source is changed to 2 V. Then step 1 is repeated.
3. The voltage across the DC source is changed to 3Vand 4V, and the previous steps is repeated. The results of measurement is tabulated as it is illustrated:

Table 1: The results of measurement

#	V: Measured voltage (V)	I: Measured Current (mA)	R = V/I (Calculate)
1	1	10	100 Ω
2	2	20	100 Ω
3	3	30	100 Ω
4	4	40	100 Ω

4. The similar measurements is repeated for 200 Ω and 300 Ω resistors.

Discussion:

The result of the measurement is sketched in the Figure 4. As this figure shows, Ohm's law introduces a linear relationship between the voltage drop across a resistor and the current that passes through it.

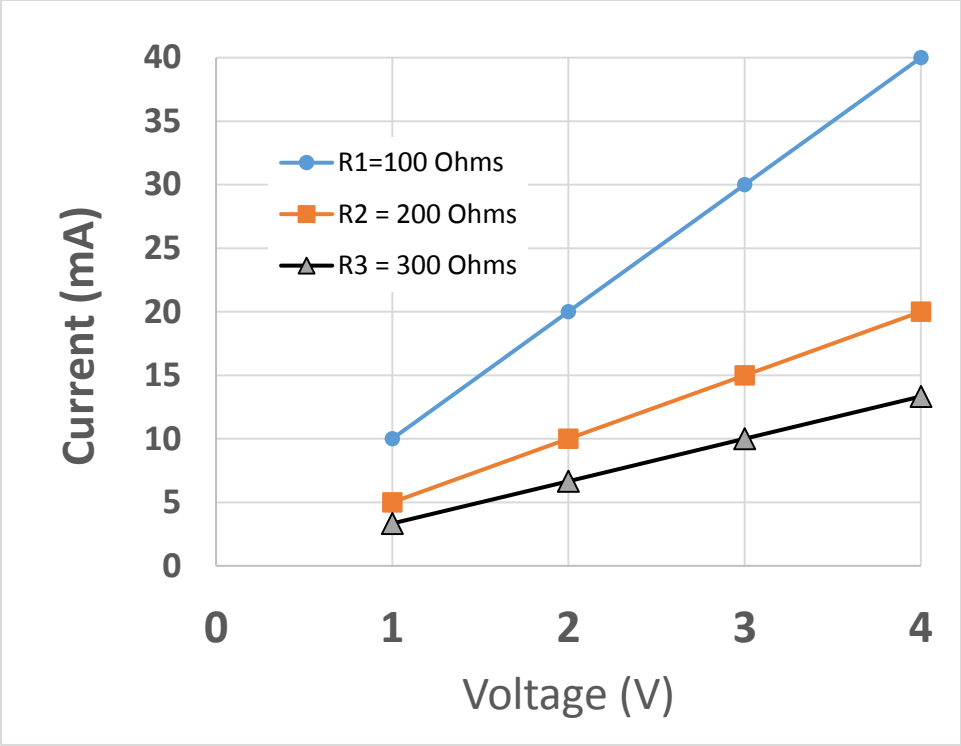

Figure 4: Current magnitude in 3 different resistors versus the voltage across them

R_1 = 100 Ω, R_2 = 200 Ω, R_3 = 300 Ω

By increasing the resistance, the slope of I-V characteristics decreases, as it Figure 4 shows and as it is also expected from Ohm's law.

Conclusion:

Ohm's law was investigated using measurements in the lab. The measurement results were accurately or at least very closely support the theoretical expectations. During the measurement process, the accurate range of the meters and the correctness of the circuit were checked. The voltage across the DC voltage source and the resistor were equal, which means the ammeter does not affect the current magnitude in the circuit.