Experimental General Physics for Engineers II

Laboratory Report PHYS 194 summer 2022

Section: __L01___

Experiment name: Ohm's Law

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Table of results (1.25 pts)	
Graph (1.25 pts)	
Data analysis (2 pts)	
Discussion (0.5 pt)	
References	
Others	
Report Grade (5 pts)	

1. Table of results (two resistors in parallel)

Put the correct units in the table

(Two resistors in series)

V (volt)	u(V) (volt)	*I* (ampere)	u(I) (ampere)
1.02 V	±0.01	0.06 A	±0.01
2.01 V	±0.01	0.12 A	±0.01
3.02 V	±0.01	0.19 A	±0.01
3.99 V	±0.01	0.24 A	±0.01
5.02 V	±0.01	0.31 A	±0.01
6.01 V	±0.01	0.38 A	±0.01

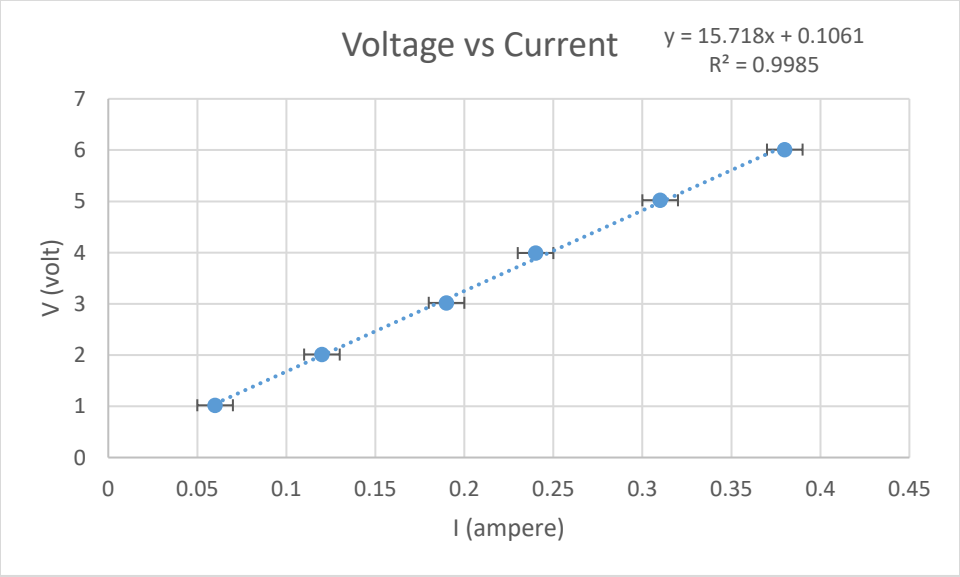
(Two resistors in parallel)

V (volt)	u(V) (volt)	*I* (ampere)	u(I) (ampere)
0.50 V	±0.01	0.15 A	±0.01
1.01 V	±0.01	0.29 A	±0.01
1.49 V	±0.01	0.44 A	±0.01
1.98 V	±0.01	0.58 A	±0.01
2.49 V	±0.01	0.74 A	±0.01
2.99 V	±0.01	0.89 A	±0.01

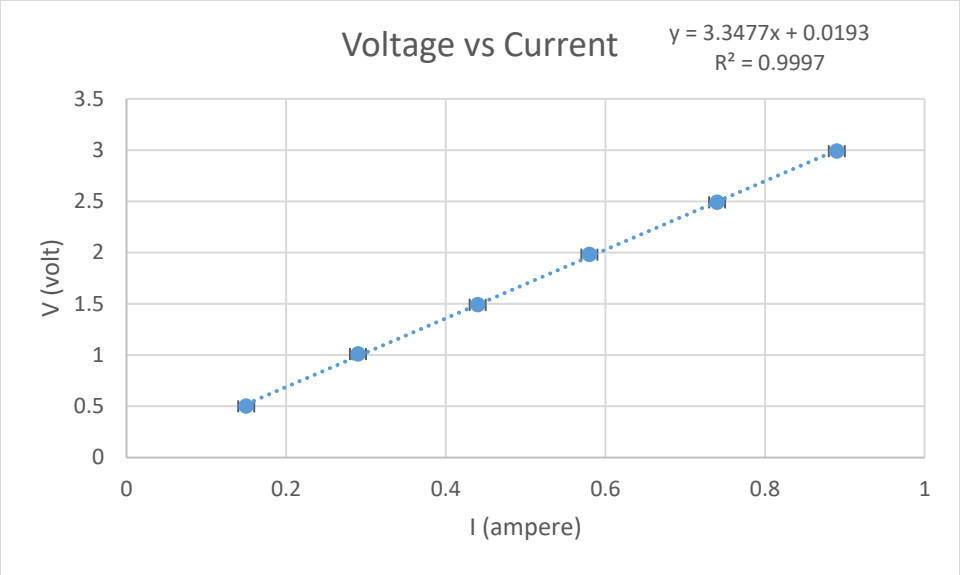
2. Graphs of I vs. V

Insert the graphs here

For Two resistors in Series



For Two Resistors in Parallel



3. Data analysis (for all the following questions you need to answer for series and parallel connection)

3.1. Theoretical value of R_{eq}

For Series,

Req (series) = R1 + R2 = 10 + 5 = **15 Ω**

For Parallel,

1/Req = [1/R1 + 1/R2] = 1/10 + 1/5 = 1/10 +2/10 = 3/10 Ω

Req = 10/3 = **3.3 Ω**

3.2. Propagated error of theoretical value of R_{eq}.

For Series,

U(Rs) = sqrt((u(R1)^2)+(u(R2)^2)) = sqrt(0.1^2+0.1^2) = **0.141 Ω**

For Parallel,

U(Rp) = sqrt (($R2^2$ * U(R1)/$(R1+R2)^2$)^2+($R1^2$ * U(R2)^2/$(R1+R2)^2$)^2

= sqrt ((5^2*0.01/15^2)^2+(10^2*0.01/15^2)^2)

= **0.046 Ω**

3.3. Slope and intercept of the graphs and their uncertainties.

For Series,

Slope = 15.71 Ω

U(Slope) = ±0.30 Ω

Intercept = 0.106 V

U(Intercept) = ±0.073 V

For Parallel,

Slope = 3.348 Ω

U(Slope) = ±0.030 Ω

Intercept = 0.019 V

U(Intercept) = ±0.017 V

3.4. Experimental values of R_{eq} and its propagated error.
After plotting V vs I and taking ohm's law into consideration using V=IR
For Series,
Experimental value of Req= **15.71 ±0.30 Ω**
For Parallel,
Experimental value of Req= **3.348 ±0.030 Ω**

3.5. Comparison between theoretical value and measured values for R_{eq}.

|Theoretical value-experimental value/theoretical value| x 100

For Series,
% Error = | 15-15.72/15 | x 100 = **4.8%**
For Parallel,
% Error = | 3.3-3.35/3.3 | x 100 = **1.51%**

4. Discussion.

(Give a brief comment on whether your results are in agreement with what was expected or not and mention all the possible sources of error that you may have faced during the experiment).

The results of this experiment were calculated and are close to the theoretically calculated values. The error difference is by 4.8% for resistors connected in series and 1.51% for resistors connected in parallel.

Some of the sources of error could be due to the rounding of values and errors in the multimeters used since we obtain all our values from multimeters. Also, given resistors and obtained value may be slightly displaced based on some slightly loose connections. All this gives us an error percentage of 4.8% and 1.51%, and satisfies the theory and percentage of error is reasonable.

References