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<u>Electrotechnology lab 1 report :</u>

<u>Objective:</u>

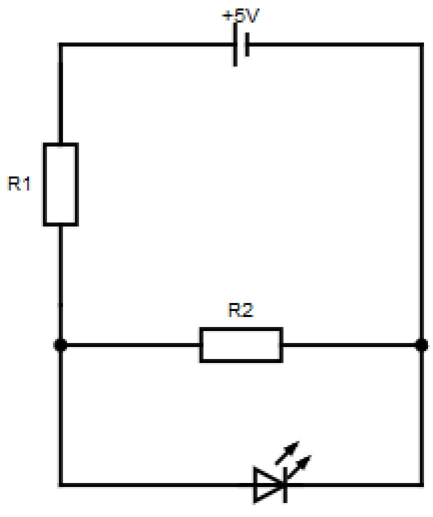
For our first lab, we are to demonstrate Kirchoff's Current and Voltage Laws, the first one states that the total current entering a node is equal to the total current leaving the node. The second law says that the voltage drop across a closed loop is equal to zero at every instant. Both those laws have in common a form of conservation of either electric charge or energy.

<u>Method:</u>

First of all we're going to build the following circuit :

Where R1 = 220 Ω

R2 = 50 / 100 / 220 Ω



This circuit has a resistor in the main branch, before the first node, we can get the total current that way and know how much is entering the node.

To prove the law of current we'll then want to get the current exiting the node: by measuring the current of R2, in the first loop, and the current of the LED, in the second loop. When adding their value we are expecting to get the same value measured for R1. That's because current separates itself into both branches,

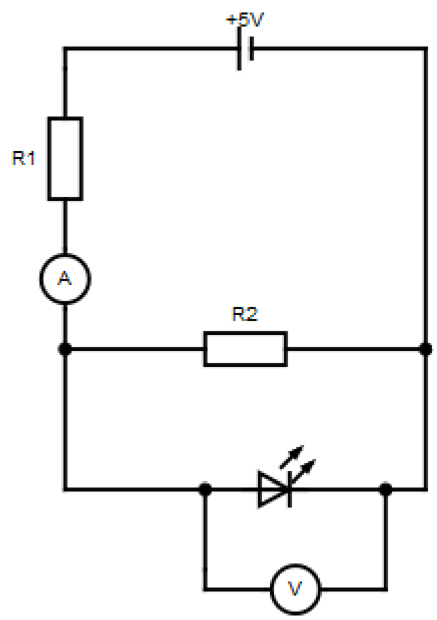
Result expected: I(R1) = I(R2) + I(LED)

For the law of voltage, we know the total voltage, we set the power supply at 5Volts. By measuring the voltage across R1, R2 and the LED we can show that voltage drop across the whole circuit is 0, in other term:

Result expected: V(total) – V(R1) – V(LED) – V(R2) = 0
And V(R2) = V(LED)
The voltage drop across two branches in parallel is the same.

Data:

We did the measurement, using the voltmeter in parallel and the ammeter in series, like such (for example):

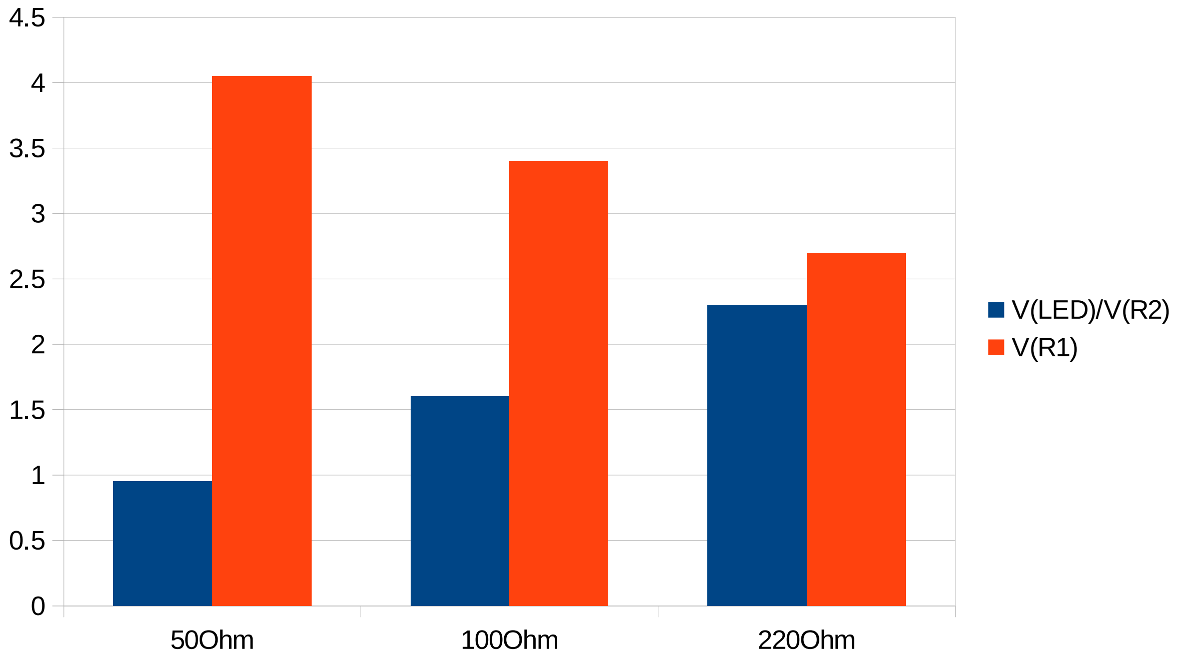


We measured the following results:

	R2=50Ohm	R2=100Ohm	R2=220Ohm
V(LED)/ V(R2)	0.95V	1.6V	2.3V
V(R1)	4.05V	3.4V	2.7V
I(LED)	0	0	1.7mA
I(R1)	17.7mA	15.5mA	12mA
I(R2)	17.7mA	15.5mA	10.3mA

Data Analysis:

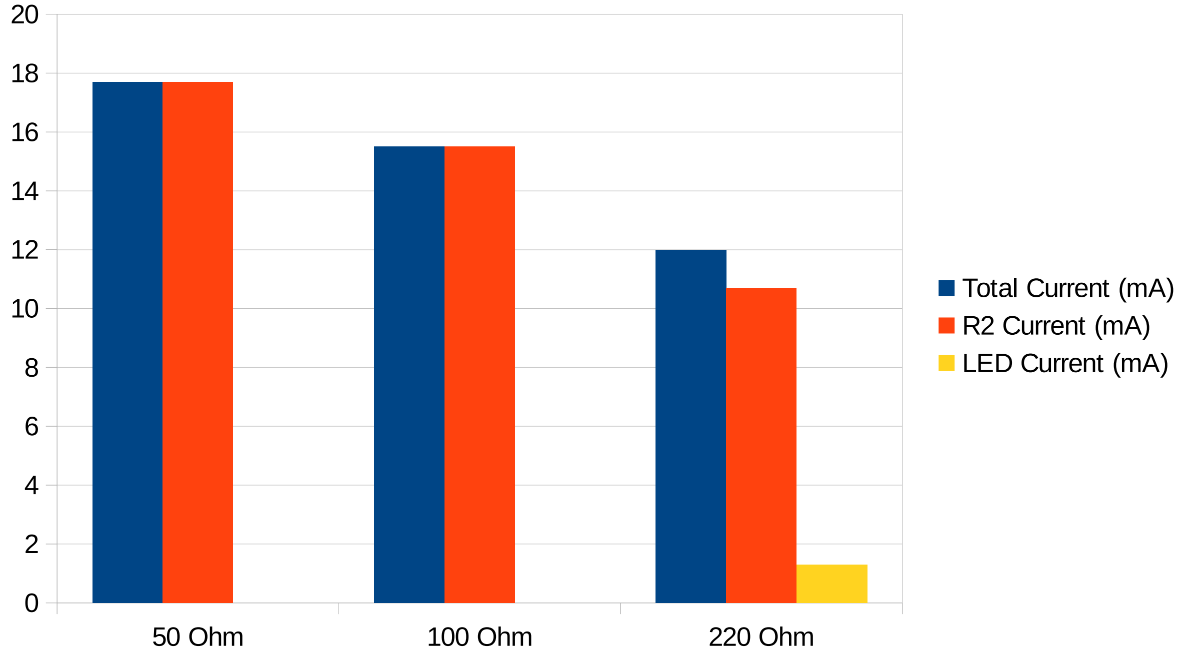
First thing we notice, only when R2=220Ohms we have some current going through the LED and have it light up. We measured the LED resistance it was about 650Ohms which is much higher than R2 which is in parallel. Therefore most of the current, if not all, goes to R2.



We can notice on the graph, that the higher the resistance is in the branch, the higher the voltage drop is, although the total remains unchanged. It is always the same as the total voltage. Algebraically this means:

Vtotal = V(R1) + V(LED)
Vtotal – V(R1) = V(LED)

We just demonstrated Kirchoff's law of Voltage.



For the current, we notice that the total current get smaller and smaller as the resistance increases. That is because of Ohm’s law and the fact the total voltage is always of 5 volts. But we do have Kirchoff’s law of current. When the current in R2 is equal to the total current, we have no current in the LED. And when some of the currant goes to the LED we still have as much currant leaving the node as is entering it.

Conclusion:

We’ve been able to show case Kirchoff’s law of Current and of Voltage. During the lab we got a bit worried when the LED didn’t light up with the 50 Ohm and 100 Ohm resistor but after checking if the circuit was working properly we were confident everything was working as normal. This was an easy experiment to do but really important to help visualize Kirchoff’s laws, to understand how the current splits into both branches and that the voltage is the same across the different loops.