EEEE 281: Experiment 1

Voltage Division

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To: Section 2B TA: Ryan Tatu, Jorge Wang, and Liam Callaham
Date: Performed: 5 February 2019 Due: 12 February
Subject: Lab 1
Lab Partner(s): None

Component	Percentage of Grade (%)	Score	Comment
Report Formatting	20		
Hand Calculations:	10		
PSPICE Setup:	5		
PSPICE Simulation:	10		
PSPICE Discussion:	10		
Experimental Setup:	5		
Experimental Data:	20		
Experimental Discussion:	20		
Total Score:			
Graded By:			

Abstract

The abstract section should contain a summary of what was performed in the lab and should be approximately 150-200 words. This should succinctly rephrase the purpose of the laboratory. It should also refer to the data collected. What theory/data is observed for each circuit? In general, an abstract should refer to some of the specific data collected. However, in this report it is more appropriate to give a general overview.

1 Introduction and Theory

Write a paragraph to describe the objectives of the laboratory. After this, follow the section headings in the template, including the required figures.

1.1 Theory: Circuits Investigated

In this section, you should introduce the reader to the circuits you investigated in the laboratory, and demonstrate the theoretical value of the circuits.

- Include a figure that illustrates Circuit 1's schematic. To simplify the number of figures you will need later in the report, it is recommended that you use the schematic diagram you build in PSPICE for each circuit. The figure should have a caption below as illustrated in Figure 1.1.1.
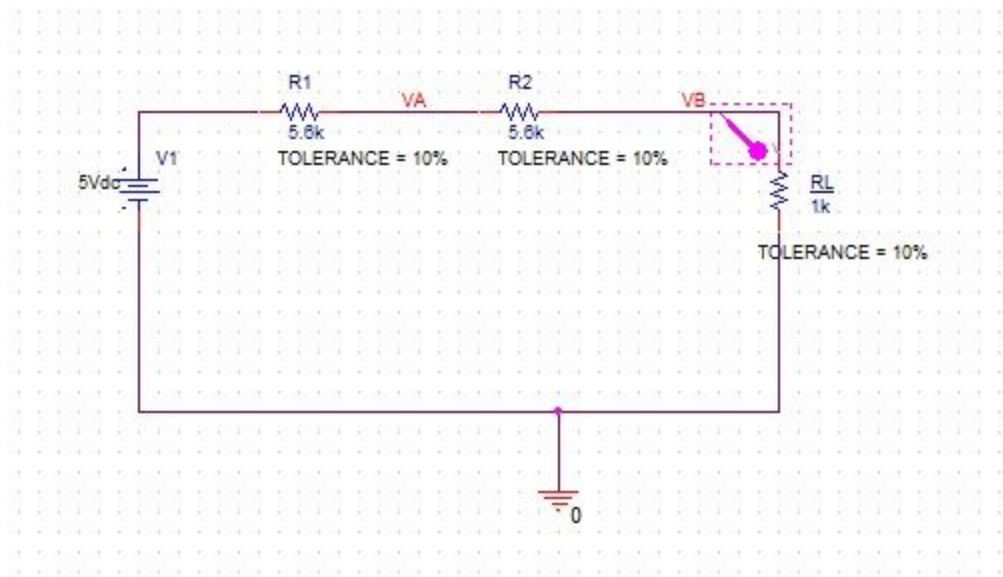

Figure 1.1.1: Schematic diagram for Circuit 1.

- The schematic of the circuit should be described here in a short paragraph. An example of the text is in the lab handout, Section 4.1. As a guide, rephrase the text in your report.

1.1.1 Theory: Kirchhoff's Voltage Law and Voltage Division

In this section, you should briefly introduce the reader to the concepts of Kirchhoff's Voltage Law and Voltage Division. You do NOT need to derive expressions for each here. For each circuit:

- Determine the voltage drop across **each** circuit element via hand calculations. **Use this information to determine the nodal voltages.**

- Integrate the calculations into the text of the document. You do not necessarily need to show every detail here. The final results of the calculations should be listed in Table at the end of the report.

- Please **DO NOT** include a scanned image of hand calculations for this report. They should be typed into the text, with equation numbers on the right hand side.

1.2 Theory: PSPICE Simulation Summary

Begin by providing a 1 paragraph description of the PSPICE setup. Was a DC simulation used, transient simulation, etc.? Which **libraries** and **PSPICE elements** were used in the simulation? As you develop your lab reports this term, aspects of this text may be applicable in future reports. In order to determine the libraries used, you can find the information when you look at the properties of each element. There will be a reference to a ".olb" file. This is the library name. Look to the Appendix in Prof. Rommel's PSPICE tutorial if you are not sure as to the names/nomenclature. For example, the resistors used are "R/ANALOG" from the **analog.olb** library.

1.2.1 PSPICE: DC Simulation of Circuit 1

In this section, include:

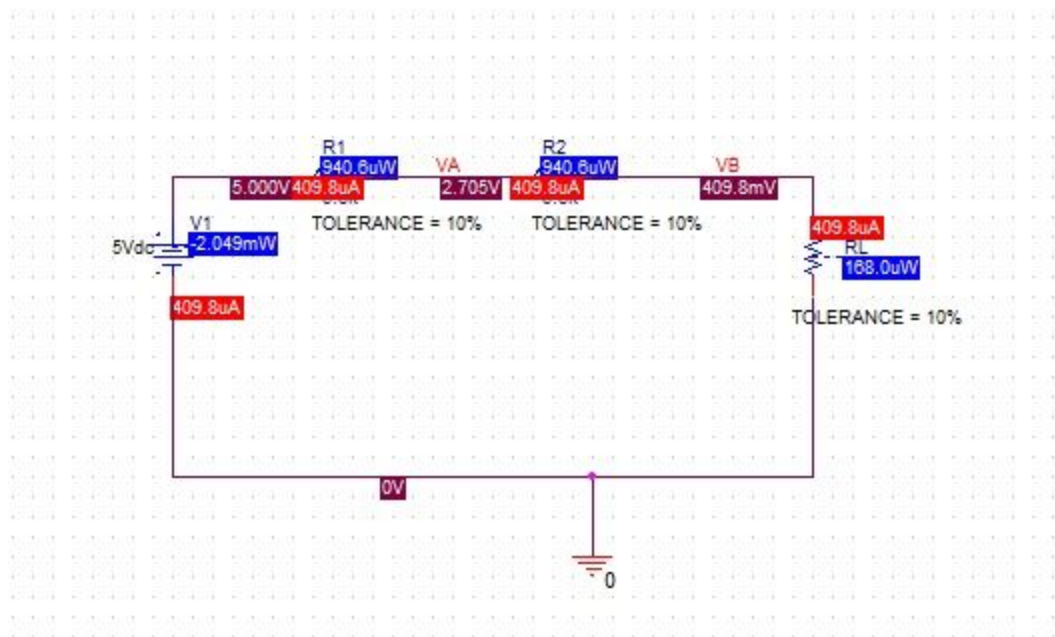- A figure with a screen shot of the schematic in PSPICE with voltage markers (Fig. 1.2.1).

Figure 1.2.1: Circuit 1 with voltage markers.

- Briefly comment about the results and whether they agree with your hand calculations. This should be one to two sentences in length and written in paragraph form.

- The PSPICE values will be reported in Table 1.

Table 1: Simulation results for Circuit 1.

Node	Voltage (V)
Supply	5.000
Node A	2.705
Node B	0.4098

1.2.2 PSPICE: Monte Carlo Simulation for Circuit 1

In this section, include:

- A figure (Fig. 1.2.2) of the histogram resulting from the Monte Carlo Simulation.

- **Explain what the results mean.** This is here because it will help to explain any percent error that you see in the hardware portion.

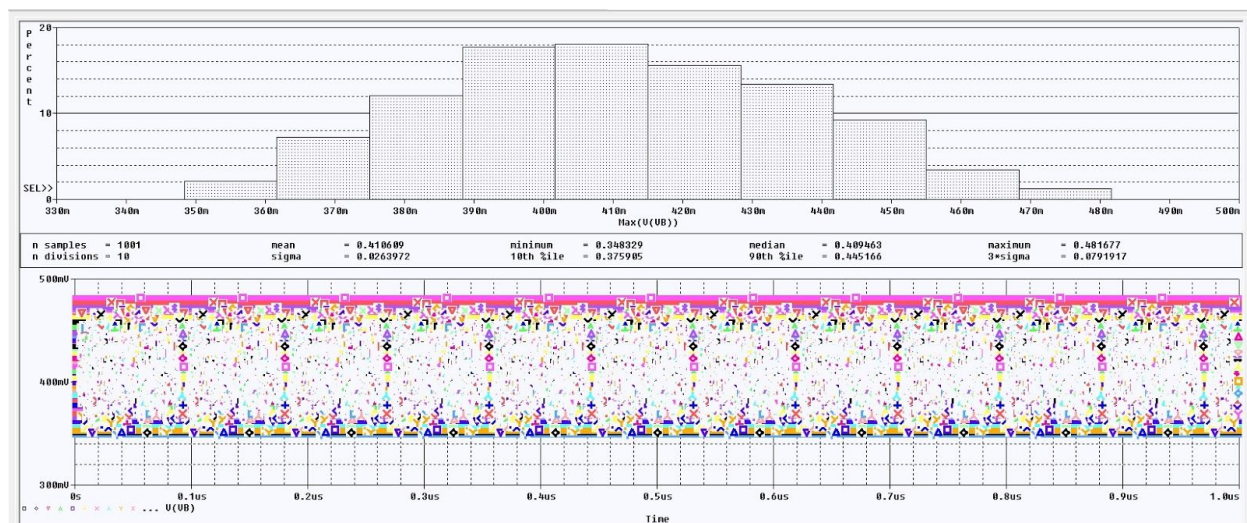- Report the mean and sigma from the Monte Carlo histogram.

Figure 1.2.2: Monte Carlo of Circuit 1.

2 Hardware Experiment: Results and Discussion

This section of the report should present what was done in hardware. A reader should be able to recreate an experiment from the detail present. One section discusses the equipment used in the experiment. The remaining sections discuss the results for each circuit.

2.1 Equipment Used in the Laboratory

Write a short paragraph to detail the equipment used in the laboratory, and specific model numbers. Ideally, you should create a table of the equipment which should be referred to in text (See Table 2 as an example). The room location where the experiment was performed should be included. Note that this should be a part of all Tech Memos, as it is an essential piece for other users to replicate your experiment. **As you will be likely using the same equipment throughout the term, once the text/tables are established, you may reuse the information with the permission of your instructor/TA.**

Table 2: Equipment/Software required for Lab 1.

Item	Tool	Room
Simulation	OrCAD Capture CIS	All Open EE Labs
DC Power Supply	Agilent E3630A	09-3170
DC Power Supply	Agilent E3631A	09-3200
Multimeter	Agilent 34401A	09-3170, 09-3200

2.2 Hardware Results/Discussion Circuit 1

At least a paragraph should be included here to discuss the results. Some points to include are listed below:

- Present the nodal voltages measured in Table 3.

Table 3: Experimental nodal voltages for Circuit 1.

Node	Voltage (V)	Percent Error With PSPICE
Supply	4998	
Node A	2270	
Node B	4590	

- Present the differential voltages measured in Table 4.

Table 4: Differential voltages and measured resistances for Circuit 1.

Element	Component Value	Measured Resistance (Ω)	Voltage (V)
Supply	5	N/A	4.983

R$_1$	5600	5496	4.983
R$_2$	5600	5615	4.983
R$_L$	1000	987	4.983

- Kirchhoff's Voltage Law (sum of all voltages around a closed loop=0) is satisfied. Provide a simple calculation to back this up.

- Compare the measured result to the PSPICE for the **nodal voltages** reported in Table 3. Perform an error analysis and report the data in the table.

3 Conclusion

Provide a 1 paragraph summary of the laboratory experiment. What were the major conclusions for each circuit topology? Also did the theory agree with the experiment? The conclusion is a revised version of the abstract.

4 Acknowledgments

Acknowledge **any** source of help received in the experiment/writing the report. This should certainly include your lab partner/teaching assistant/instructor. It may also include other classmates/study partners. State briefly what the nature of the help was.
Your report should include references to appropriate pages in the text, as well as any other sources, websites/etc. consulted in the preparation of the report.

References

[1] C.K. Alexander, and M.K.O. Sadiku, *Fundamentals of Electric Circuits, 4th Edition*, McGraw Hill, pp. xx-yy(EDIT), 2009.
[2] S. Rommel, *EEEE 281 Lab 1 Lecture notes*, slides xx-yy, Spring 2015.