

# Physics 219\_2018 - Nick Pun/Exp. 0 (Intro to Lab Elect)/Exp 0 Introduction to Lab



SIGNED by Nick Pun Sep 20, 2018 @01:07 PM PDT

Rob Kiefl Sep 06, 2018 @10:25 AM PDT

## Experiment #0: Introduction to Laboratory Electronics

Partner: Rob

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

### 1. Objective

Nick Pun Sep 13, 2018 @02:13 PM PDT

Reword objective in your OWN words AFTER reading entire lab. It should contain more detail than the objective in the instructions. This should be done as part of the pre lab exercise.

This experiment will allow us to become familiar with the tools that we will be using in this course's lab.

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

### 2. Introduction/ Background

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

There isn't much introduction/background/theory for this lab and there isn't really a common theme. So delete this section if you want. But in all future labs you need to include it

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

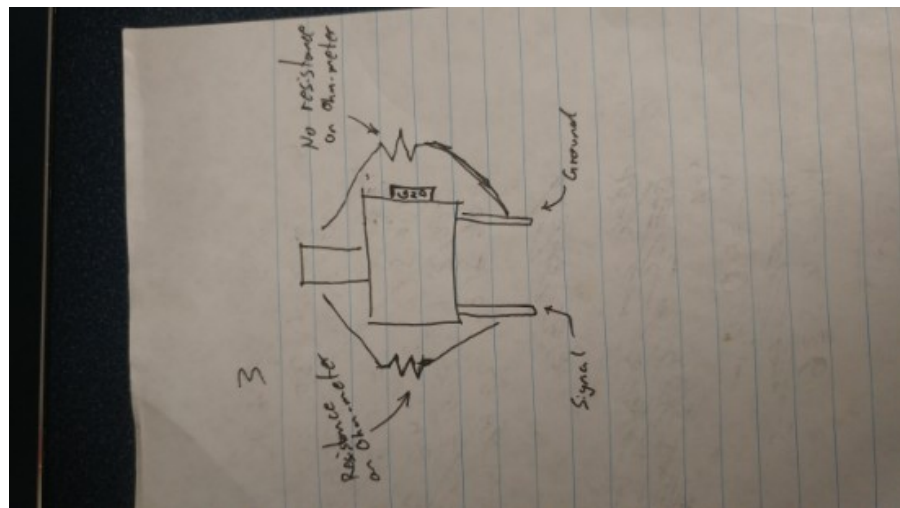
### 2.Connectors and Cables

Rob Kiefl Sep 06, 2018 @11:32 AM PDT

Describe your activities and findings changed

Nick Pun Sep 20, 2018 @01:02 PM PDT

The side that has the tab that says GND is the ground connection. We found this by connecting a resistor from the metal casing to the a prong and testing to see if the ohm-meter registered any resistance.



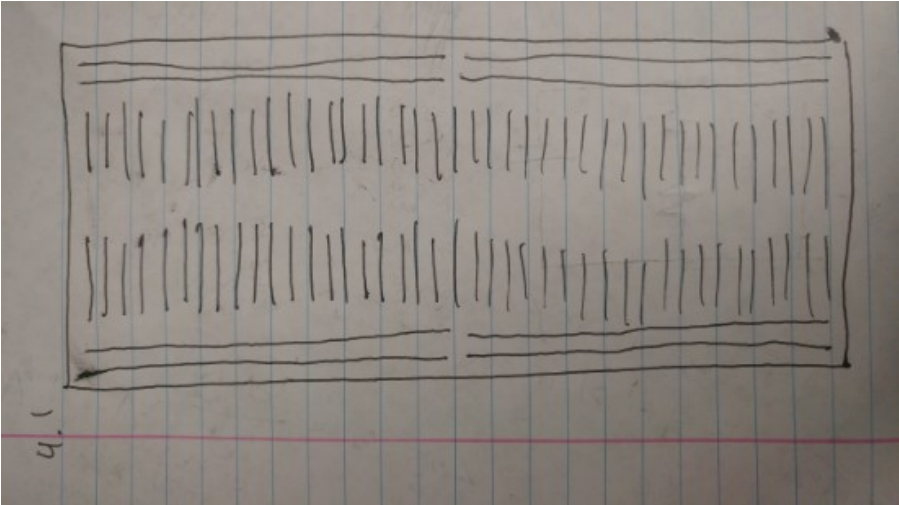
### 3. Prototype Board

Rob Kiefl Sep 06, 2018 @11:34 AM PDT


Nick Pun Sep 20, 2018 @01:02 PM PDT

include a sketch of the circuit. You can include a photo of what it looks like but this does not replace a sketch.

Long connections along the sides running the length of the breadboard, shorter connections in between running the width of the breadboard.

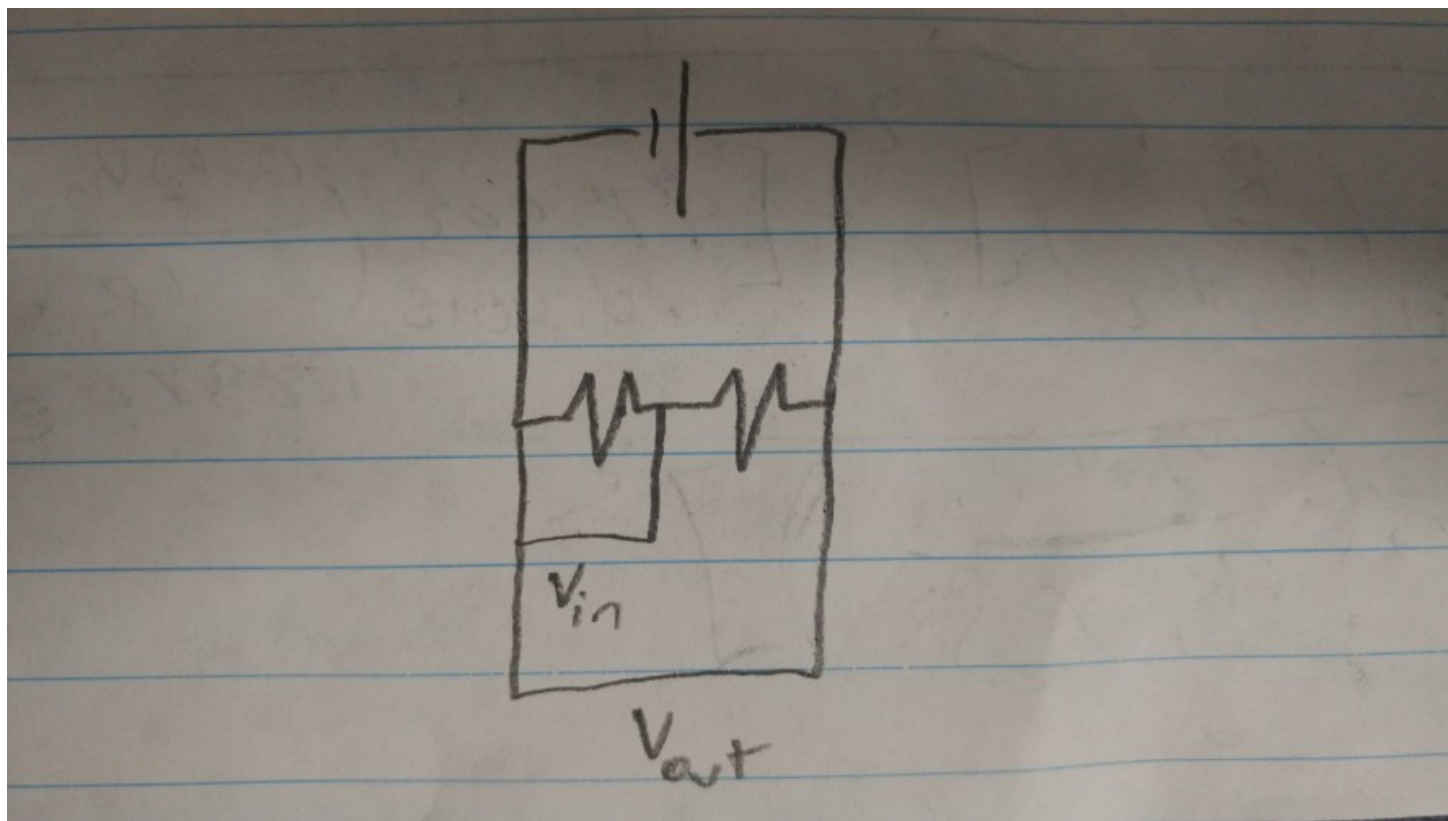


Rob Kiefl Sep 06, 2018 @08:22 AM PDT

### 4. DMM and Derived Uncertainties

## 4.1 Voltage Divider

show circuit diagram and give expressions of  $V_{out}$  as a function of  $R_1$ ,  $R_2$ , and  $V_{in}$



$$V_{out} = V_{in} \frac{R_1}{R_1 + R_2}$$

## 4.2 Measurements

Give measurements of all quantities:  $R_1, R_2, V_{out}$  and  $V_{in}$  with uncertainties

$R_1 = 97.993 \text{ k}\Omega$  w/ 0.15% uncertainty

$R_2 = 98.082 \text{ k}\Omega$  w/ 0.15% uncertainty

$V_{out} = 2.536 \text{ V}$  w/ 0.04% uncertainty (measured)

$V_{in} = 5.094 \text{ V}$  w/ 0.04% uncertainty

$V_{out} = 2.547 \text{ V}$  (calculated)

used formula from lab (fig. 5.1) for  $V_{out}$  uncertainty

$$\sigma_{V_{out}} = \sqrt{\left[5.094 \left(\frac{R_1}{R_1 + R_2}\right)\right]^2 + \left[97.993 \left(\frac{R_2 V_{in} - V_{in} R_1}{(R_1 + R_2)^2}\right)\right]^2 + \left[98.082 \left(\frac{V_{in} R_1}{(R_1 + R_2)^2}\right)\right]^2}$$

Result:  $1.8878 \times 10^{-3}$

show calculation for how you determined uncertainty in expected value for  $V_{in}$

$$5.094 \times 0.0004$$

## 4.3 Comparison of Expected $V_{out}$ with Measured $V_{out}$

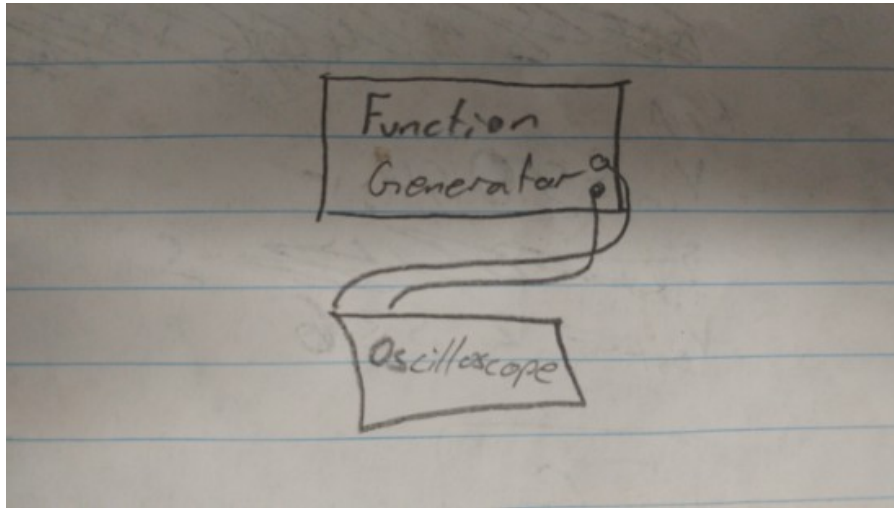
Compare results and note whether they agree within uncertainties as well as what possible causes could be if they don't agree

T-score comparison (to upload)

## 5. Oscilloscope and Function Generator

## 5.1 Basics

Describe setup (what/how you connected things, a sketch would be good).



Nick Pun Sep 13, 2018 @04:44 PM PDT

<describe results studying oscilloscope adjustments>

"Fine" moves cursor a single increment for fine tuning.

There are hor and vert cursors.

Trigger stops graph.

Nick Pun Sep 13, 2018 @04:41 PM PDT

<describe study of triggering>

Moved trigger up and down to see where graph stops.

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

## 5.2 Measurements Using Scope

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

Nick Pun Sep 13, 2018 @04:50 PM PDT

<Always include uncertainties including how you determined them>

Uncertainties determined by manufacturer. V: 2% t: 20ppm.

Nick Pun Sep 13, 2018 @04:58 PM PDT

Measurement of amplitude and period

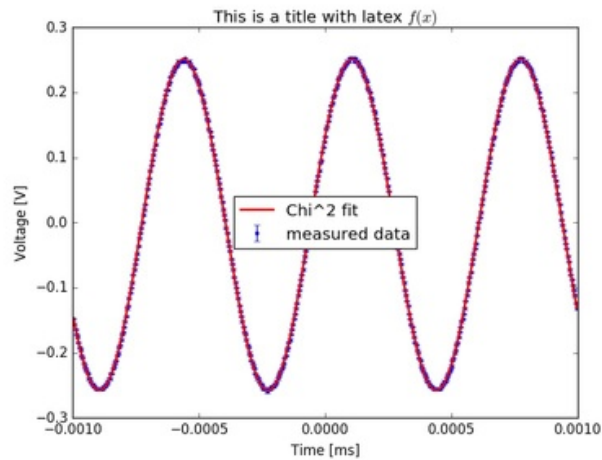
	Period	Vpp	Channel
<b>Cursor</b>	992 us	4.2 V	1
<b>Automatic (via Menu)</b>	1 ms	4.08 V	1

Rob Kiefl Sep 06, 2018 @08:38 AM PDT

Rob Kiefl Sep 06, 2018 @08:22 AM PDT

<for raw data downloaded by scope, import as an excel file>

Rob Kiefl Sep 06, 2018 @08:22 AM PDT



figure\_1-1.jpeg(85.5 KB)

Rob Kiefl Sep 20, 2018 @12:39 PM PDT

## 6. Conclusions

Nick Pun Sep 20, 2018 @12:58 PM PDT

The second example circuit in 4.2 is better because the shorter wires makes the circuit easier to see. The different colours of the wires also make it easier to follow the circuit. It is less messy and the components are also spaced further apart so you can see everything.

Nick Pun Sep 20, 2018 @01:06 PM PDT

In the end, this lab has taught me how to use a breadboard, function generator, and oscilloscope. Some small thing I learned along the way includes tips on how to keep my circuits organized and readable, how to calculate uncertainties, and how to read resistors.

Nick Pun Sep 20, 2018 @12:42 PM PDT



lab00.csv(2.5 MB)