Plotting Data

Physics 3110
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The Art of Experimental Physics, D. Preston & E. Dietz, NY, John Wiley, (1991), pp. 18 - 22

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Plotting on the Computer

- Excel
- Gnuplot – http://www.gnuplot.info/
- PSI plot
- Mathcad
- Mathmatica
- SciDavis
- Origin
- Etc.

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Graph Guidelines

- Graphs should be big and clear, with data symbols, numbers, and labels that can be easily read.
- Label axes, include units.
- Use symbols to indicate data points.
- Graphs, like all figures, must have a caption that explains their contents.
- Graphs, like all figures, must be referred to in the text by #, in order of appearance.

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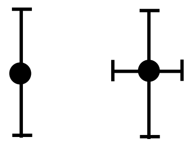
Graph Guidelines



- Use error bars to indicate errors in measurements.
- DO NOT connect points with straight lines (almost never)
- If you are trying to show that your data is described by a certain function, i.e. linear, sine, etc., you need to either show the function on the same plot, or fit the data.

Graphs in Your Reports

"…Taking account of the nondegeneracy for $n \leq 2$ gives the solid curve in Fig. 1, which includes prominent well known resonances. Including nondegeneracy for $n \leq 4$ [26] gives the dotted curve in Fig. 1."

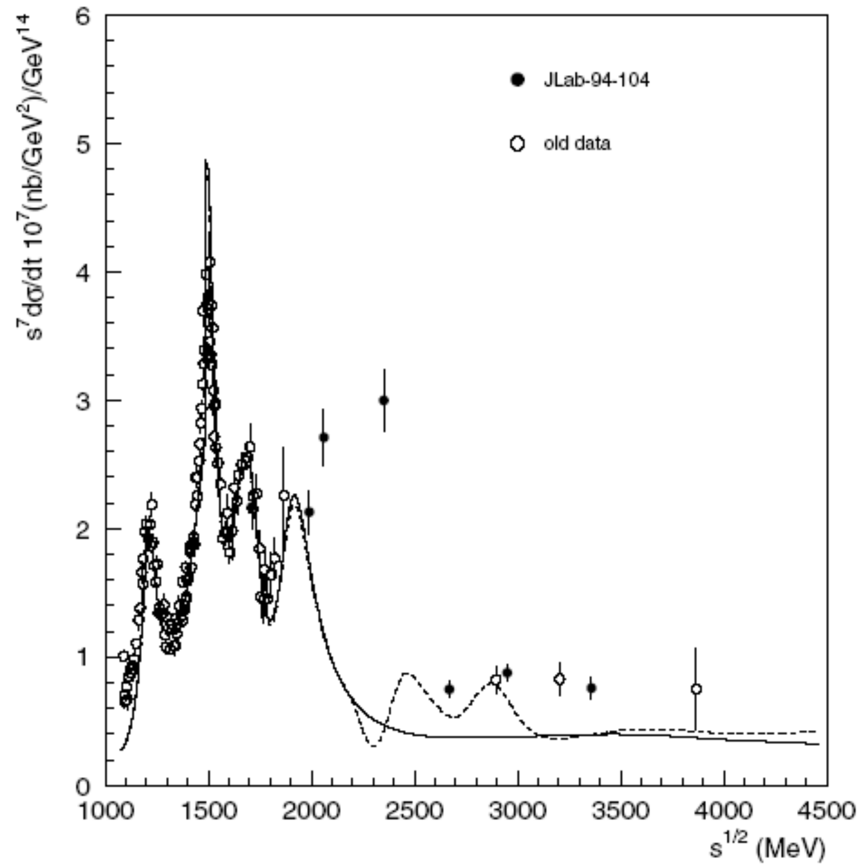


FIG. 1. Energy dependence of the differential cross section for π^+ photoproduction at $\theta = 90°$. The solid curve denotes degeneracy breaking for $n \leq 2$, while the dotted for $n \leq 4$. The empty circles are old data from Ref. [20], and the solid dots are new data from JLab [21].

"Locality of Quark-Hadron Duality and Deviations from Quark Counting Rules Above the Resonance Region", Qiang Zhao1 and Frank E. Close,Phys. Rev. Lett., 022004, **91**, 2003.

Examples

Figure 1 displays the data points along with the best fit model.

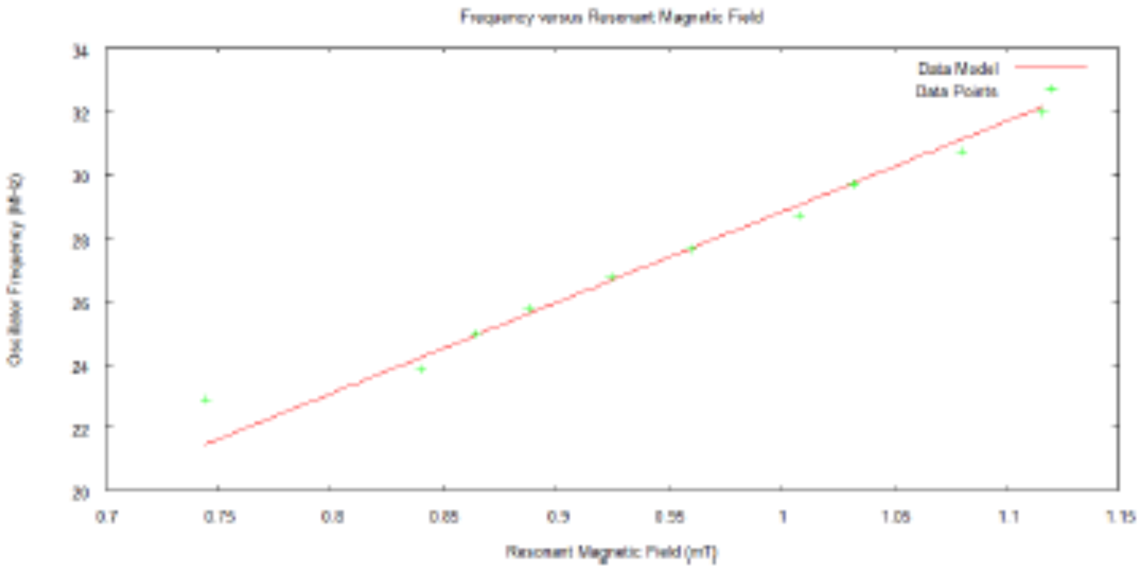


FIG. 1. Setting equation 8 equal to hυ and solving for υ gave rise to an equation suitable for finding μ_s using the least sum of squares method for a linear equation in GNUPlot.

Figure 1 displays the data points along with the best fit model.

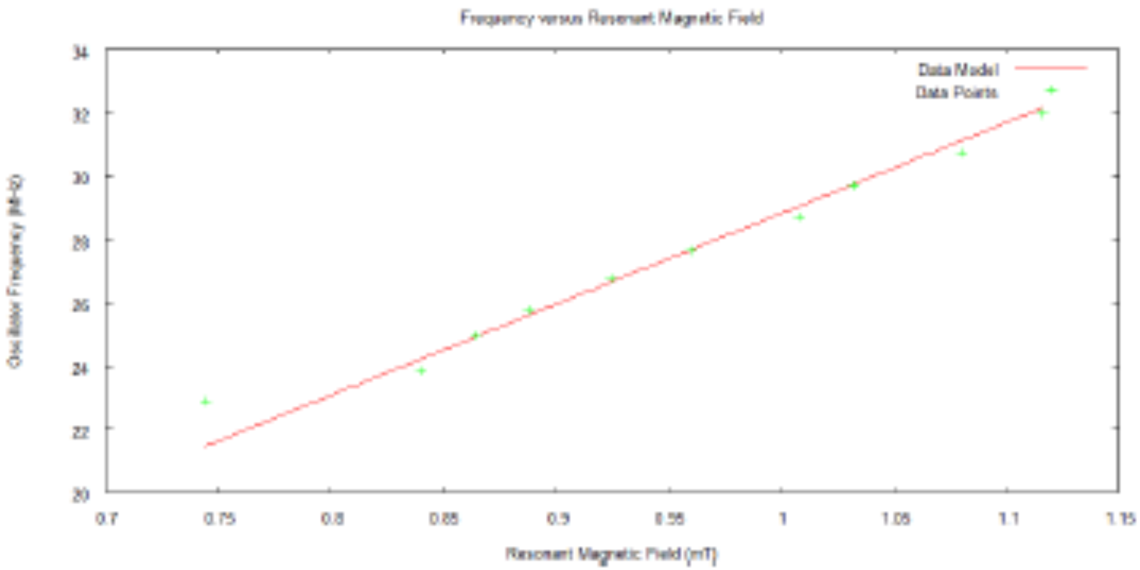


FIG. 1. Setting equation 8 equal to $h\upsilon$ and solving for υ gave rise to an equation suitable for finding μ_s using the least sum of squares method for a linear equation in GNUPlot.

<u>Good</u>

Caption

Fig. 1 is mentioned by name in text above.

<u>Bad</u>

All fonts too small

No error bars

Too much info in Caption.

FIG. 1: Graph 1

1.png

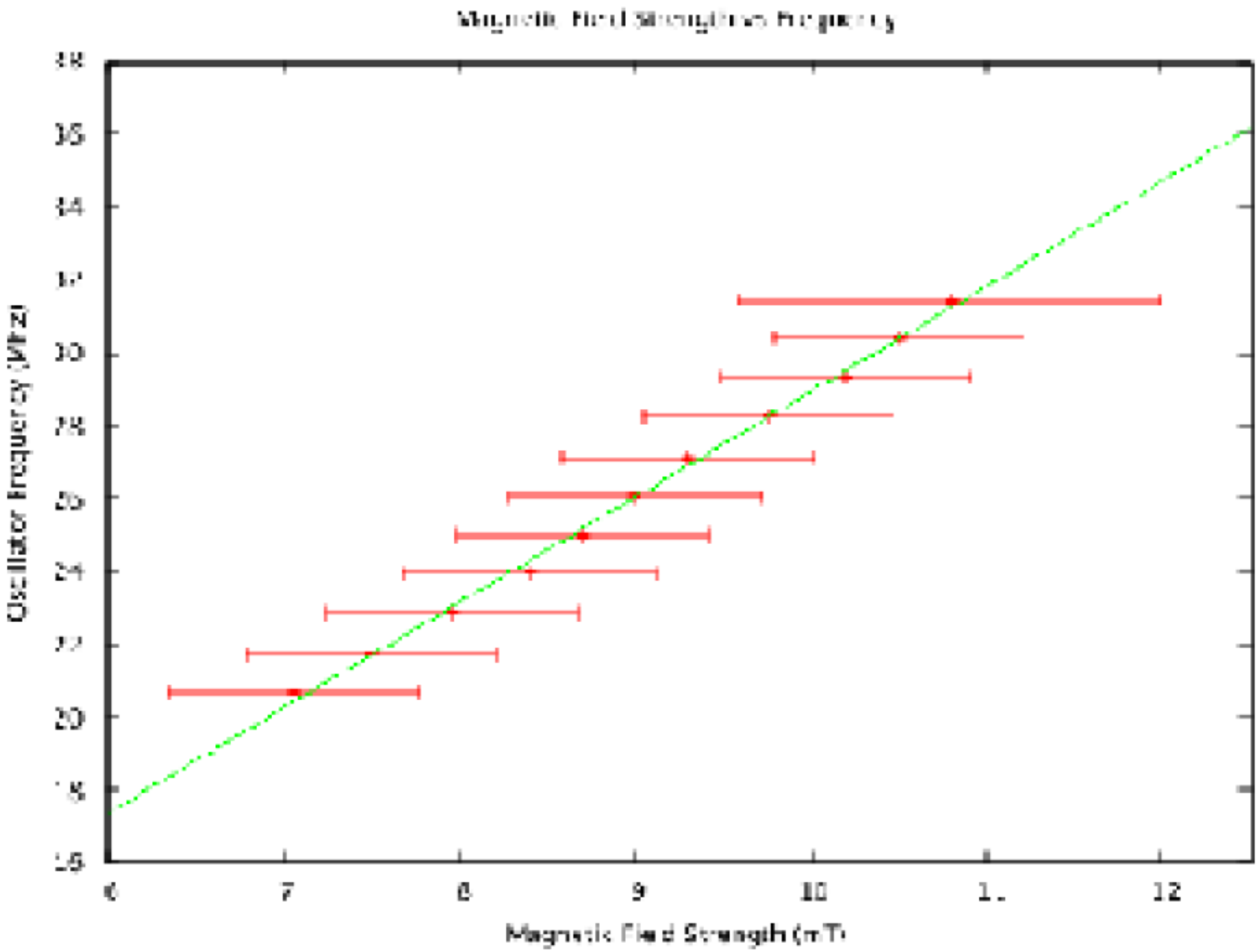
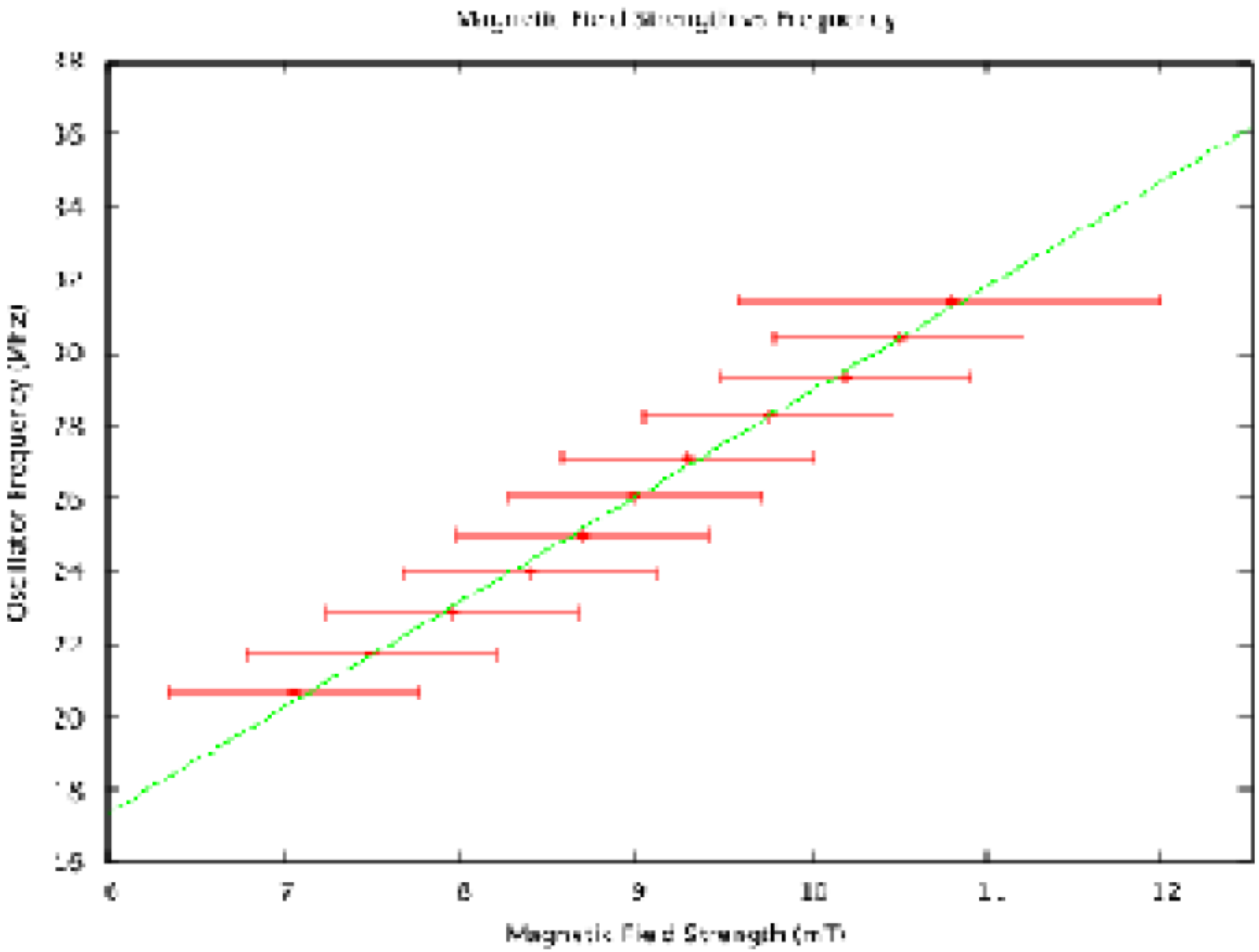


FIG. 1: Graph 1

1.png



<u>Good</u>

Data symbols

Error bars

<u>Bad</u>

No caption.

Can’t read the fonts

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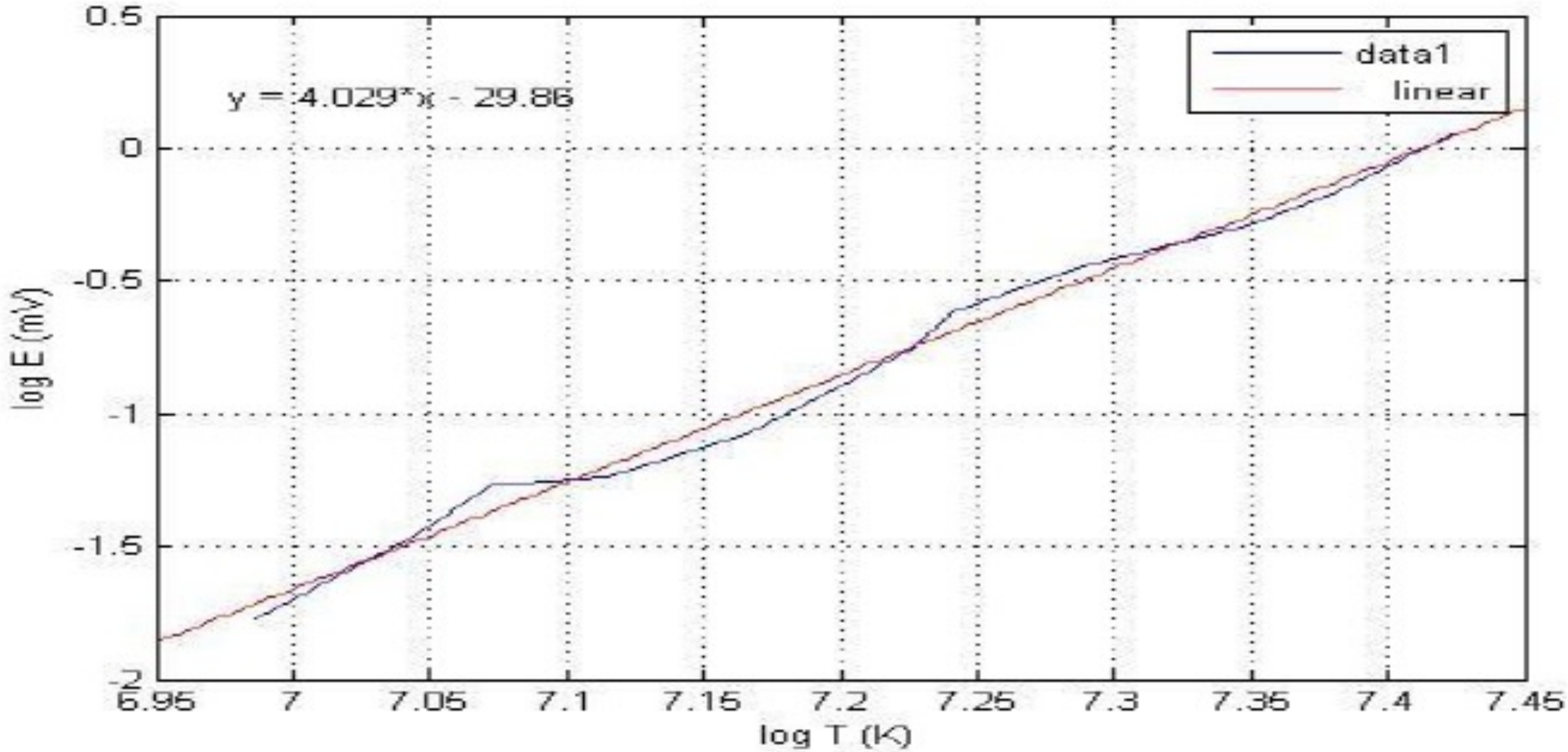

Figure 2: Displays the slope of log T vs. log E. A linear fit is placed on our data and we take a linear fit to get the slope equivalent to approximately four for the Stefan-Boltzmann experiment.

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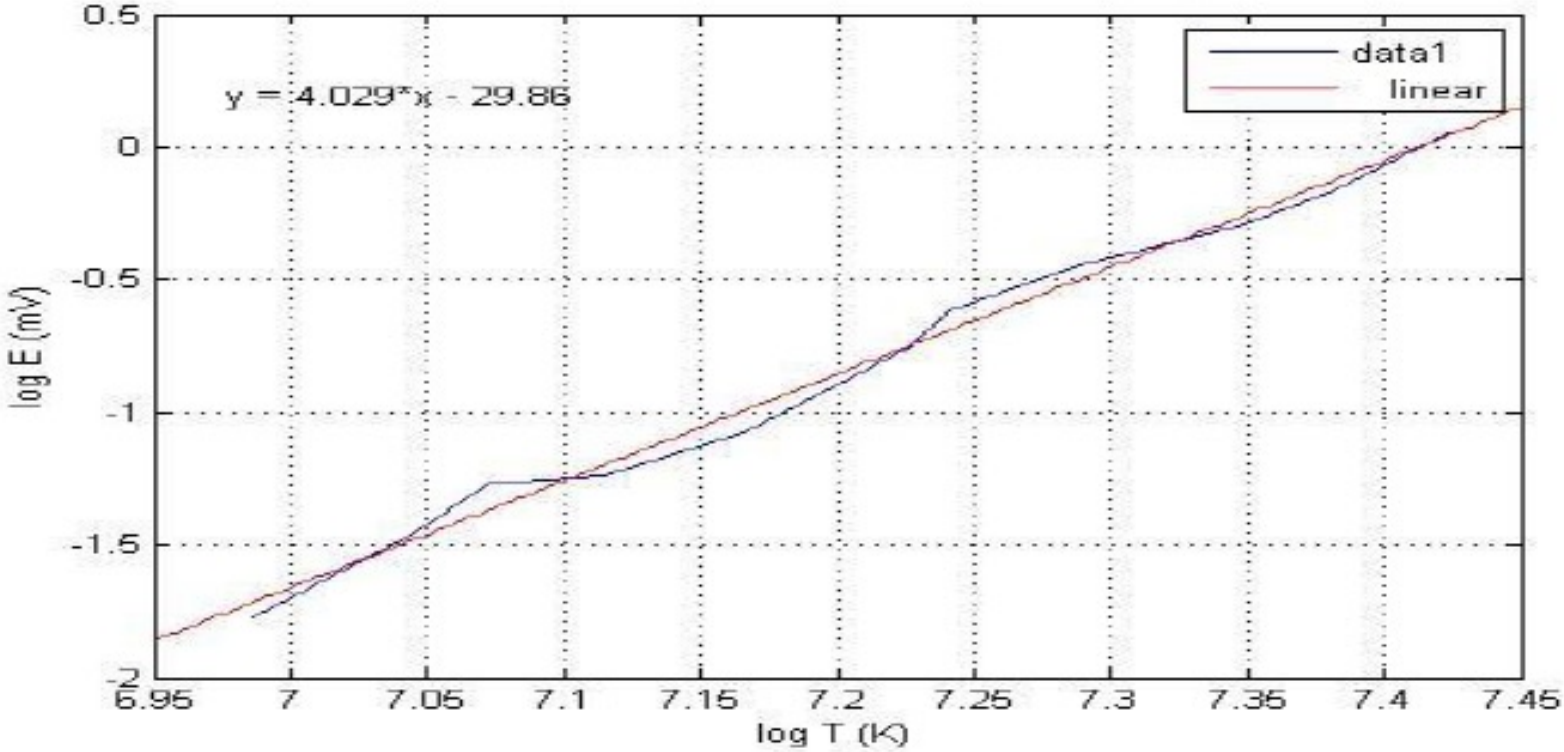

Figure 2: Displays the slope of log T vs. log E. A linear fit is placed on our data and we take a linear fit to get the slope equivalent to approximately four for the Stefan-Boltzmann experiment.

Good
Caption
Axes are labeled and units are shown
Legend

Bad
No data symbols shown
Instead, data points connected with lines

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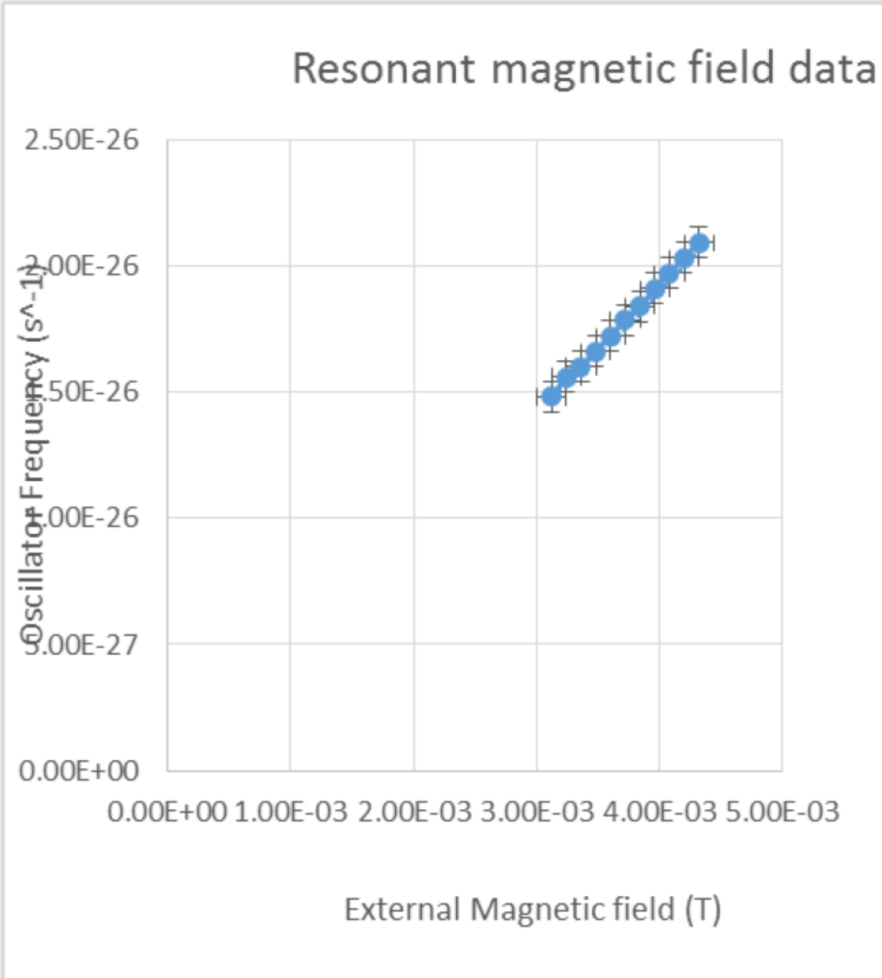
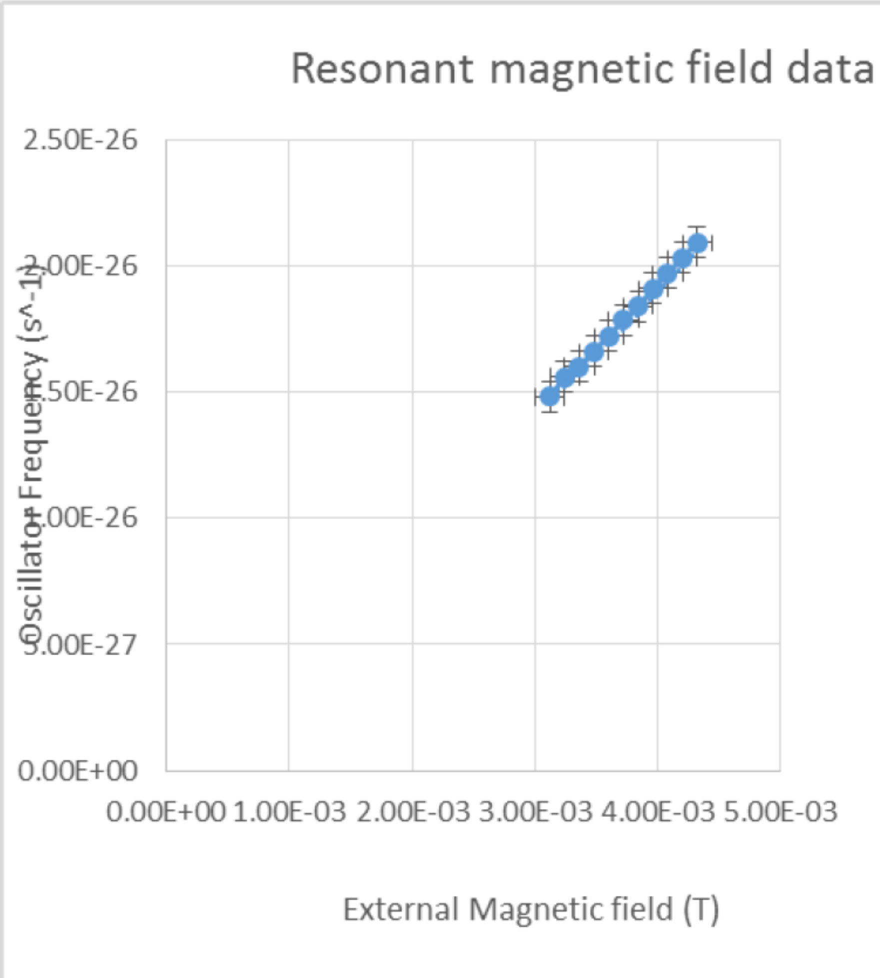
26 ± .000125 and 5.72E-03 ± .0191. We plotted the relationship of the 2 parametersin the following graph:



Then after plotting the relationship between the 2 parameters we then moved on to the signal height and angle of the probe and plotted the relationship of the 2 parametersin the following graph:



Then after plotting the relationship between the 2 parameters we then moved on to the signal height and angle of the probe and

<u>Good</u>

Axes are labeled

Data symbols shown with error bars

<u>Bad</u>

Can’t read numbers.

No caption.

Data squeezed into small part of plot.

Text doesn’t mention Figure by #, there is no number to refer to.

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The first part of our experiment showed a distinct wave like pattern that we would expect. This shape can be seen in Fig. 1.

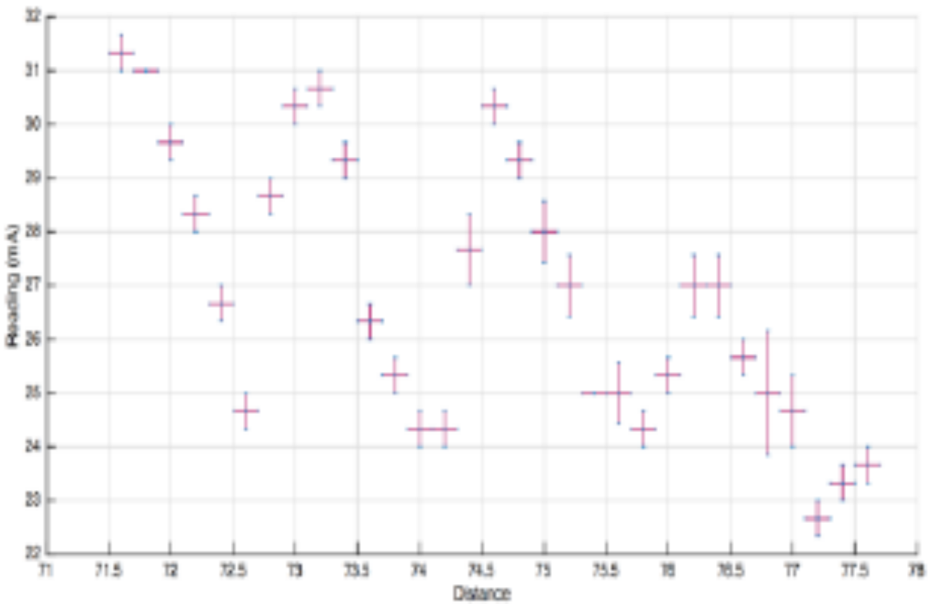

Fig. 1: Plot of distance versus meter reading for the first experiment

The first part of our experiment showed a distinct wave like pattern that we would expect. This shape can be seen in Fig. 1.

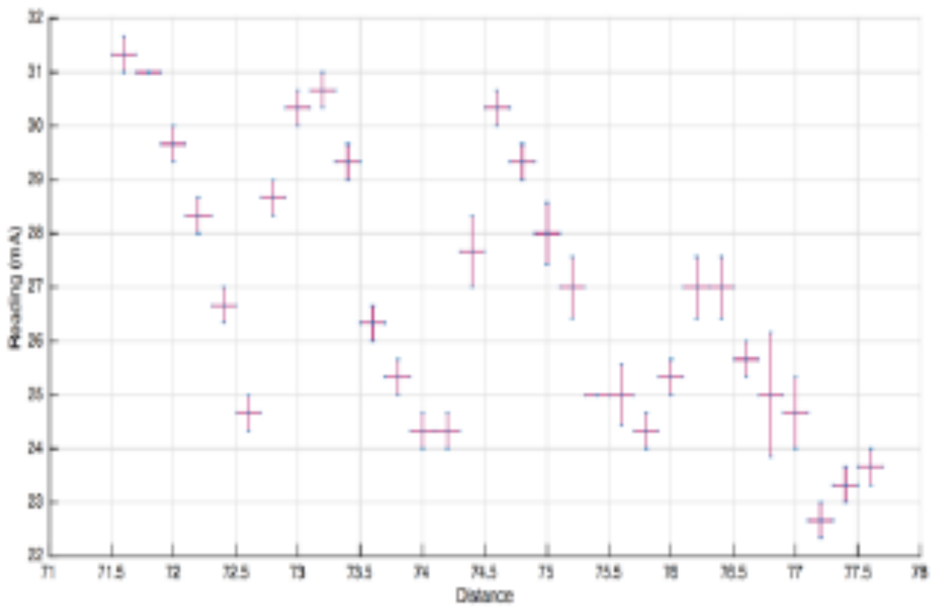

Fig. 1: Plot of distance versus meter reading for the first experiment

<u>Good</u>

Caption

Fig. 1 is mentioned by name in text above.

Axes are labeled

Data symbols shown with error bars

<u>Bad</u>

All fonts too small

Axis units not labeled

This is an exception about connecting data points. Without it, the data trend is not obvious.

Meter reading vs. distance

Homework

1. Using Excel, plot the two files below. The independent variable is in the 1st column, the dependent variable is in the 2nd column, and the uncertainty in the dependent variable is in the 3rd column. Include the error bars and axis labels. (You can make up your own axis labels and units.)
   A. linedata.dat
   B. Gauss2.dat
2. Repeat, using a different computer program of your choice. Tell me what program you used.
   A. linedata.dat
   B. Gauss2.dat
3. Which program did you prefer? Why?

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