A Wonderful Piece of Scientific Research

A thesis submitted in partial fulfillment of the requirement
for the degree of Bachelor of Science with Honors in
Physics from the College of William and Mary in Virginia,

by

Ima G. Physicist

Accepted for _____
(Honors or no-Honors

_____
Advisor: Prof. Marie Curie

_____
Prof. Richard P. Feynman

_____
Prof. Chien-Shiung Wu

_____
Prof. Ernest J. Rutherford

Williamsburg, Virginia
May 3, 2019

Contents

Acknowledgments

I would like to thank lots of people, and this is where I will do it...

List of Figures

List of Tables

Abstract

An experiment was conducted at the Thomas Jefferson National Accelerator Facility (JLab) to study something very interesting and unusual....

The abstract should present a synopsis of all the main results of the research, and should be self-contained. Generally, there should not be citations in an abstract.

Chapter 1

Introduction

I have provided some suggested Chapter titles here, but you should use what makes sense for your research.

The introduction should present the primary motivation (i.e. big picture motivation, what big science question(s) your research is trying to answer or assist in answering) for the research and the results that you are presenting. You should also provide background information on your research (what has been done before) and also mention what some of the applications of your research are. You can also discuss some of the specifics of the exact thing you are working on.

1.1 The Goal of the Experiment/Research

One can have sections of chapters and sub-sections as well (sub-sub-sections are possible, but are probably overkill for your purposes.

Chapter 2

Theory

Lots of theory...

You can introduce the basic concepts and theory that are necessary for understanding your research objective, methods, and results.

2.1 Quantum Chromodynamics

This is a subsection of the Theory section. Quantum chromodynamics is a wonderful theory... here is a citation [1] from a textbook, and here is another [2] from a journal article.

Meson Spectrum in QCD

Here is a numbered equation, taken from the thesis of A. Dubanowitz [3]:

$$\frac{\phi \to a_0\gamma}{\phi \to f_0\gamma} = 0. \tag{2.1}$$

We now introduce another equation, where we show that we need to define every symbol in an equation. The parity-violating electron-proton scattering asymmetry A_{ep} can be expressed as

$$A_{ep}/A_0 = Q_W^p + Q^2 F^p(Q^2, \theta) \quad , \tag{2.2}$$

where $A_0 = -G_F Q^2 / \left(4\pi\alpha\sqrt{2}\right)$, G_F is the Fermi constant, and α the fine structure constant. Q^2 is the four-momentum transfer squared. The second term, $Q^2 F^p$, contains the nucleon structure defined in terms of electromagnetic, neutral-weak, and axial form factors, which are encoded in the hadronic form factor F^p.

Notice that equations are parts of sentences, and should be punctuated as such. Read a real article from a refereed journal (such as Physical Review or Physical Review Letters to see how this should be done). Short, unnumbered equations can even appear inline in a sentence, as was done in the preceding paragraph.

Every table you include must be referred to in the body of the text, they can't just stand on their own. For example, we show the dominant decay branching ratios of the ϕ meson in Table 2.1. You can refer to a section or chapter of your thesis, for example, we can look back to Sec. 2.1 for a description of Quantum Chromodynamics.

Decay Modes $\phi \rightarrow$	Branching Ratio
K^+K^-	$(49.1 \pm 0.8)\%$
$K^0_L K^0_S$	$(34.1 \pm 0.6)\%$
$\rho\pi + \pi^+\pi^-\pi^0$	$(15.5 \pm 0.7)\%$
$\omega\gamma$	$< 5\%$
$f_0(980)\gamma$	$< 1 \times 10^{-4}$
$a_0(980)\gamma$	$< 5 \times 10^{-3}$

Table 2.1: Main decays of the ϕ meson and their measured branching ratios. Notice that the caption is not the same as the much shorter title for the table, which appears in the List of Tables. You can see how to provide both the full caption and the title of the table by looking at the .tex source code.

A similar statement applies for figures. For example, we show a single event display of a typical radiative decay in Fig. 2.1. Figures and tables should not appear earlier than they are first referenced in the body of the text, if at all possible.

Here I refer back to Eq. 2.1; notice the use of an abbreviation for the word "equation". Equation 2.2 shows how we refer to an equation at the start of a sentence.

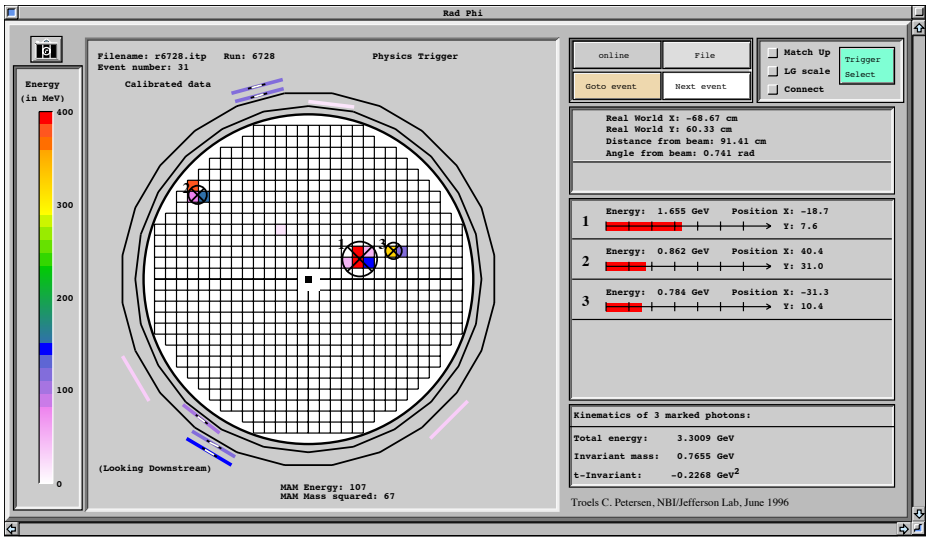

Figure 2.1: This is a very nifty figure, which should be described in detail in this caption. Remember to describe all relevant aspects: what is plotted against what, if it is a graph, what the relevant features and symbols are, *etc.* . Your reader should be able to read the caption and understand everything of relevance in the figure. Figure captions should be in complete, properly punctuated sentences.

Chapter 3

Experimental Technique

Chapter 4

Results

Chapter 5

Conclusion/Outlook

Appendix A

My Great Computer Program

You may wish to include some material in appendices, such as this one. An appendix should have material that is not required to be read by the average reader of the thesis, but which may be useful for some readers, and to document important material for the future - *i.e.* the next folks to carry and expand your work. You can include things like additional data, code, instructions for use of some piece of equipment or software, etc.

A.1 Code sample

The following is the C code which .....

```
/*********************************************************/

/*   Ima G. Physicist   */

int makeBSDHits(itape_header_t *event, time_list_t *timeList)
{
#define nBSDChannels 48  /*corresponds to the number of scintillators of the BSD*/
  adc_values_t *bsd=NULL;
  tdc_values_t *tbsd=NULL;
  int i,j,k,m;
  int size;

  int adcValue[nBSDChannels];
  int ntdchits[nBSDChannels];

  struct bsdtimes{
    int ntimes;
    int tdctimes[16];
```

```
  };

  struct bsdtimes tdcValue[nBSDChannels];

  for(i=0; i < nBSDChannels; i++){
    tdcValue[i].ntimes=0;
    for(j=0; j < 16; j++){
      tdcValue[i].tdctimes[j]=0;
    }
  }

  return(0);
}
```

Bibliography

[1] Perkins, Donald H. Introduction to High Energy Physics. 3rd ed. Menlo Park: Addison-Wesley, 1987.

[2] F. Close, N. Isgur and S. Kumano, Nucl. Phys. **B389**, 513 (1993).

[3] Alex Dubanowitz, Senior project thesis, College of William and Mary, 1998. (unpublished).