國 立 清 華 大 學

碩士論文

我的論文標題 (中文)

My thesis title (Chinese)

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Todo list

"Todo List" will hide when set \setboolean{publish}{*true*} in config.tex.

我的論文標題 (中文)

摘要

在此寫上你的中文摘要。

關鍵字：關鍵字, 論文, 樣板, 讓我畢業

My thesis title (Chinese)

Abstract

Write your English abstract here.

Keywords: Keyword, Thesis, Template, Graduate me

Acknowledgement

Thanks NCU, and sppmg's LaTeX template_**sppmg/tw_thesis_template_????**.

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page

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Glossary

Use table for symbol list. You can also use package “nomencl” (simple) or “glossaries” (powerful). see packages document or my tutorial (but it’s Chinese).

Glossary

VIM	:	The best guy’s editor
Emacs	:	The God’s editor
CTAN	:	Comprehensive TeX Archive Network, ctan.org

Chapter 1

Introduction

(You can copy “chapter_template.tex” or “chapter_template_demo.tex” to create new sub-file(chapter).)

Write your Introduction here. eg,

I don’t want my chaste thesis impinge by M$. But LaTeX is little hard.

Chapter 2

The ATLAS detector

2.1 Coordinates

The ATLAS (**A** **T**oroidal **L**HC **A**pparatu**S**) experiment is one of the seven detector in Large Hadron Collider (LHC) at CERN (European Organization for Nuclear Research). Its cylindrical symmetry and end caps covers nearly 4π in solid angle.

A coordinate system is used to describe every recorded signals nearby. The origin is set at the center of the detector, or the interaction point (IP). The x-axis points toward the center of the LHC ring; the y-axis points vertically upward; the z-axis points along one of the beam pipe direction such that a right-handed coordinate sysetem is created.

A modified version of cylindrical coordinate is more commonly used in the experiment. The pseudorapidity $\eta \equiv -\ln\tan(\theta/2)$, in which θ is the polar angle in cylindrical coordinate, is used to decribe the angle between the z-axis and the direction of interest. (r, ϕ) is the same system to describe the tranverse plane, with ϕ being the azimuthal angle. In addition, the cone size is defined as $\Delta R \equiv \sqrt{(\Delta\phi)^2 + (\Delta\eta)^2}$.

2.2 Components of ATLAS

Depending its function, the components are categorized into four parts - inner detector, calorimeters, muon spectrometer, and the magnetic system. Each of them consist of smaller layers.

2.2.1 Inner Detector

Beginning few centimeters from the IP, the inner decector's main function is to track the trace of charged particles by their interations with the materials. A 2T magnetic field, which surrounds the whole inner detector, causes the charged ones to bend. Based on the directions and the curvatures, one can determine their charges and momenta preliminarily. The inner detector comprises three parts - the pixel detector, the semi-conductor tracker (SCT), and the transition rediation tracker (TRT).

Located at the innermost part, the pixel detector contains four layers of modules, which is made up of 250 μm-thick silicon, each is 2 centimeters by 6 centimeters in size in the direction perpendicular to the beam. Three disks, which are made up of similar material, are at each end cap of the detector. Each module includes about 47,000 pixels, measuring 50 by 400 μm each. It covers pseudorapidity range $|\eta| < 2.5$ and its proximity to the IP is meant to measure extremely precise trace of the charged particles.

The semi-conductor tracker, having a similar concept and function to the pixel detector, lies in the middle part of the inner detector. Although having a resemblance to the pixel detector, the SCT is in a long and narrow strip-shape rather than small pixels and covers the perpendicular directions to the beam instead of nearly full coverage. The SCT, which overlays a larger area than the pixel detector does, has more sampled points and thus is of great importance on tracking the transverse directions with roughly the same accuracy compared to the pixel detector.

The outermost component, TRT, includes straw tube trackers and transition radiation detectors. Though its precision in tracking is not high and its coverage in pseudorapidity, about $|\eta|< 2.0$, is not wide compared to the other two components, TRT possesses transition radiation detection capability, which is useful for identifying charged particles. Since the lighter particles tend to have higher speed, which generates greater transition radiation, electrons and positrons, the lightest charged particles, would leave strong signals in TRT.

2.2.2 Calorimeters

Outside the solenoidal magnet, which envelops the inner detector, are the calorimeters. By absorbing the particles, the calorimeters measure the energies of them. Two layers of components compose the calorimeter systems, the inner electromagnetic (EM) calorimeter and the outer hadronic calorimeter.

As its name suggests, the EM calorimeter absorbs energies from particles that interact electromagnetically, including photons and charged particles. A pseudorapidity of range $|\eta| < 3.2$ is covered by high-granularity lead/liquid argon(LAr) EM calorimeter, which includes the barrel and end cap. In addition, a LAr persampler which is meant to correct the energy loss in materials of the calorimeters covers $|\eta| < 1.8$. For the forward region, which has the range $3.1 < |\eta| < 4.9$, a LAr EM calorimeter with copper is also deployed.

Hadronic calorimeter, although it is less precise in both energies magnitude and localization, absorbs energies from the particles that interact via strong force. Steel/scintillator-tile covering $|\eta| < 1.7$, two copper/LAr end cap calorimeters overlaying $1.5 < |\eta| < 3.2$, and a forward-regional ($3.1 < |\eta| < 4.9$) tungsten absorbers constitute the hadronic calorimeter.

2.2.3 Muon Spectrometer

Chapter 3

Result

I had a nice thesis.

Chapter 4

Conclusion

I am free, I am not own by M$.

Chapter 5

Chapter name(demo)

Content of chapter

Content Content Content.

5.1 Section name

Content of section

Content Content Content

5.1.1 Subsection name

Content of subsection

Content Content Content

5.1.1.1 Subsubsection name

Content of subsubsection

Content Content Content

5.1.1.1.1 Paragraph name Content of paragraph

Content Content Content

Subparagraph name Content of subparagraph

Content Content Content

Chapter 6

Test demo

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Second line.

Chapter 7

figure

7.1 Insert single figure(by sppmg's tool)

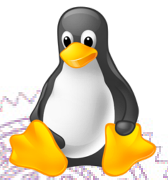
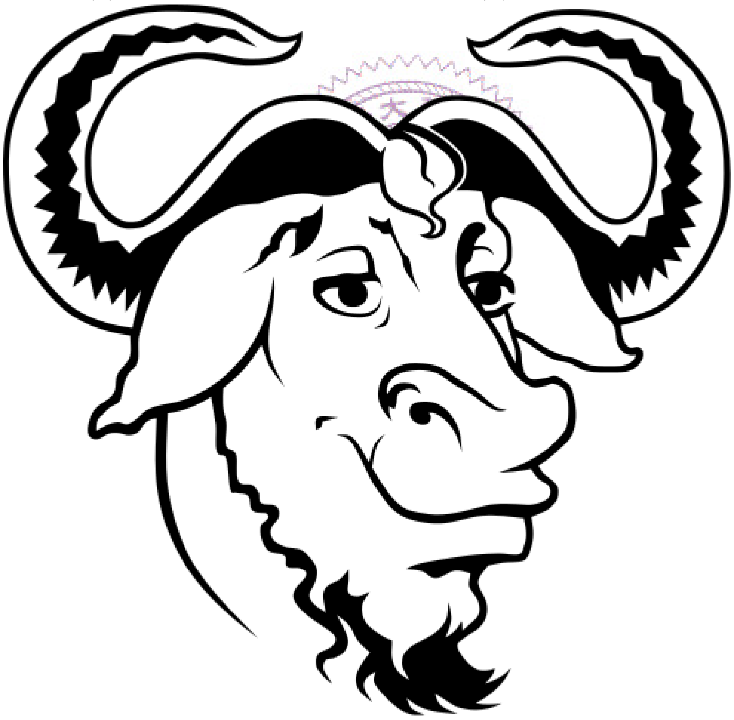


Figure 7.1: caption

7.2 Insert figures

(a) caption_1

(b) caption_2



(c) caption_3

Figure 7.2: caption, use “(b)” get ID of subfigure(this ID is Debian) in caption

Chapter 8

Table

8.1 Simple table

Table 8.1: Solution

Component	Concentration(mM)
$CaCl_2$	118.0

8.2 Auto break line table

short	short short
long	long long long long long long long long long long

Appendix A

List of device

Table A.1: List of device

device	Model	Description
Linux	Debian 9	Best of best of best OS
Windows	10	Best of Best tool to prevent the aging of brain.

Appendix B

Solutions

B.1 The solution

Table B.1: The solution

Component	Concentration(mM)
NaCl	1.0
$CaCl_2$	2.0
NaCl	1.0
$CaCl_2$	2.0

Appendix C

Code

C.1 C

Code C.1: hello_world_c.c

```c
#include <stdio.h>
main()
{
    printf("hello, world\n");
}
```

C.2 Matlab

Code C.2: hello_world_matlab.m

```matlab
fprintf('hello, world\n');
```

C.3 IDL

Code C.3: hello_world_idl.pro

```idl
print,"hello, world"

end
```