Particle Physics Project Report

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Abstract

The abstract is written here.

Contents

1 The ATLAS Detector

The text is written here. The ATLAS detector is shown in Figure 1[1].

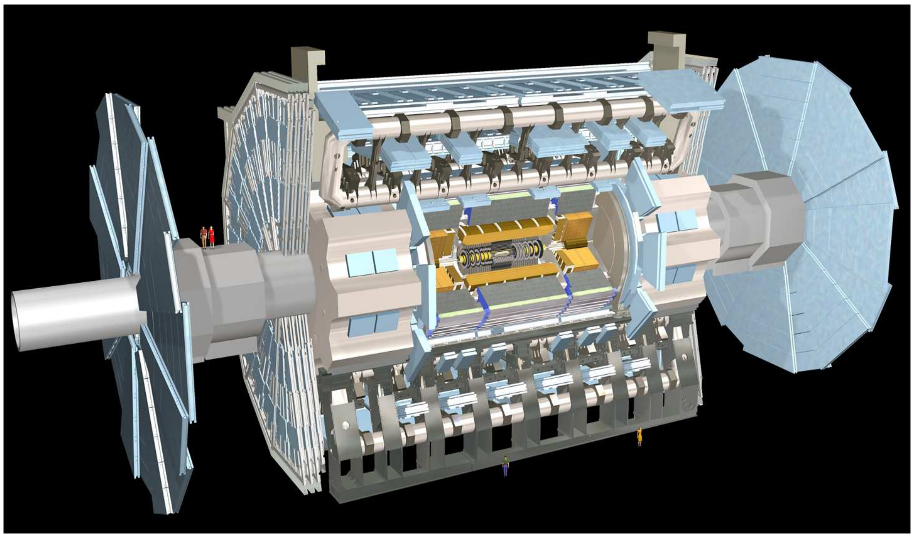

Figure 1: The ATLAS Detector

1.1 Inner Detector

The Inner Tracking of the ATLAS Detector[1]. As shown in Equation 1.

$$\eta = -ln[\tan(\frac{\theta}{2})] \tag{1}$$

As shown in Equation 2.

$$\eta = -ln[\tan(\frac{\theta}{2})] \tag{2}$$

1.2 Electromagnetic Calorimeter

1.3 Hadronic Calorimeter

2 Theory

The chosen topic for my PhD Thesis is a Search for New Physics in the High Mass, Di-Lepton Channel, focusing mainly on the decay of theoretical particles, namely the Graviton but also the Z' Boson as the signature would be very similar. I will focus on the decay of these particles to two electrons ($G/Z' \rightarrow e^+e^-$).

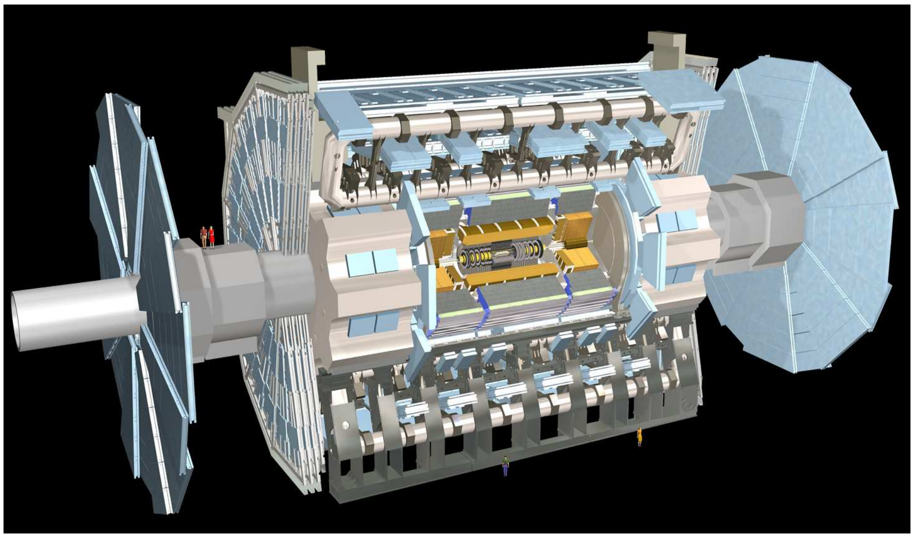

Figure 2: The Inner Tracking of the ATLAS Detector

2.1 The Graviton

$pp \rightarrow \gamma^* \rightarrow l^+l^-$,

Cut	Description	No. Events
Events	Total Number	2.61316e+06
GRL	Event in the Good Run List	2.52131e+06
Primary Vertex	Event has Primary Vertex with > 3 Tracks	2.50717e+06
Trigger Fired	Event Passed L1_EM2 Trigger	1.94842e+06
Standard Electrons	Both Electrons have Author 1‖3	219627
Et Cluster > 20 GeV	Both Electrons have $Et_{clu} > 20$ GeV	463
η	Both Electrons $\|\eta\| < 2.47$ (No Crack)	399
Opposite Charge	Electron Pair have Opposite Charge	223
Loose Electrons	Both Electrons are atleast isEM=Loose	1
Medium Electrons	Both Electrons are atleast isEM=Medium	1
Tight Electrons	Both Electrons are atleast isEM=Tight	0
Mass Region	80 GeV < Invariant Mass < 100 GeV	1

2.2 Z'/Graviton Search Potential

Mass (GeV)	Coupling (k/M_{pl})	E CM	N Events	Cross-Section (fb)
300	0.01	7	10000	521.6
500	0.01	7	10000	40.46
800	0.01	7	10000	2.996
1000	0.01	7	10000	0.7839
500	0.03	7	10000	369.5
800	0.03	7	10000	26.98
1000	0.03	7	10000	6.925
700	0.05	7	10000	163.7
1000	0.05	7	10000	19.42
1250	0.05	7	10000	4.567
1500	0.05	7	10000	1.324
800	0.1	7	10000	298.2
1000	0.1	7	10000	77.34
1250	0.1	7	10000	18.38
1500	0.1	7	10000	5.288

$$\frac{L1_{Et} - L2_{Et}}{L2_{Et}} \tag{3}$$

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