

**A Search for Evidence of New Particle Production in pp
Collisions at $\sqrt{s} = 8$ TeV in the Two-Photon, Lepton, and
 b -jet Final State**

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Abstract

This dissertation presents a search for evidence of new particle production in the two-photon, lepton, and b -jet final state in proton-proton collisions at center-of-mass energy 8 TeV. The search is performed in the full 2012 dataset, a total integrated luminosity of 19.5 fb^{-1} , collected by the Compact Muon Solenoid experiment at the Large Hadron Collider.

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Chapter 1

Introduction

The recent discovery of a new boson of mass $\sim 125 \text{ GeV}/c^2$ and the increasing evidence of its consistency with the Higgs boson are striking victories (strange wording) for the Standard Model (SM). With its success in describing electroweak symmetry breaking, the SM continues as the most well-tested and robust description of modern particle physics (that we have today). However in passing this important test, the shortcomings of this model become even more disturbing (pronounced). The SM offers no explanation for the tremendous amount of dark matter in our universe (capitalize?), nor of the observed disparity between matter and anti-matter. In particular it suffers from what is known as the Hierarchy Problem, which posits that if this newly-discovered boson is exactly as predicted, then either its mass of $\sim 125 \text{ GeV}/c^2$ is anomalously light or the result of an extraordinarily coincidental and precise cancellation of the order of one part in 10^{26} .

Many [1] of the whatever

1.1 Section Durp

This is a reference to Section 1.1.

¹⁷ Bibliography

- ¹⁸ [1] CMS Collaboration, “Observation of a new boson at a mass of 125 GeV with the CMS
¹⁹ experiment at the LHC”, *Phys.Lett.B* (2012) [arXiv:1207.7235](#).

²⁰ **List of Acryonyms**

²¹ **SM** Standard Model