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A Real Good Title

by

Paula Friederike Denner

Thesis

Submitted to The University of Warwick

for the degree of

Doctor of Philosophy

Physics

September 2018

"You know, Sir, sometimes I think
there's a great ocean of thruth out there
and I'm just sitting on the beach
playing with...with stones."

PONDER STIBBONS

"Sometimes, if you pay real close attention to the pebbles
you find out about the ocean."

TERRY PRATCHETT

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Acknowledgments

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Abstract

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Chapter 1

Introduction

The Standard Model is widely hailed as the most precisely tested model ever. Measurements of the electroweak sector at LEP agree astoundingly well with predictions from theory, and the recent discovery of the Higgs boson at the LHC appears to have completed the picture. Unfortunately the Standard Model has some very large, very obvious flaws. Firstly, it makes no statement about gravity despite it being one of the largest driving forces of the formation of galaxies, stars, and planets. In addition, measurements of the rotational velocities of galaxies have revealed that there is very likely more matter in the universe than we can see. The Standard Model does not make any predictions for what this dark matter could be made of. In fact, recent measurements of distant supernovae suggest that the expansion of the universe is accelerating, requiring some form of energy source - this dark energy is also not predicted anywhere in the Standard Model. The final large flaw is the models current inability to provide the drastic matter-antimatter asymmetry which is seen in the universe today. The discovery of neutrino oscillations in the early 2000s [1, 2], described in chapter 2 has shown one of the first glimpses of new physics beyond the Standard Model, as it demonstrates that neutrinos have mass (though it doesnt tell us exactly what that mass is). This raises new and interesting questions such as what is the neutrinos mass, and why is it so small? Neutrino oscillations allow the possibility of CP-violation in the lepton sector which is required by many new models which generate the matter-antimatter asymmetry in the universe. In addition, some proposals of additional sterile neutrinos can function as dark matter candidates. These sterile neutrinos, if they exist, may be indirectly discovered in oscillation experiments.

Hello This is going to be my Thesis[1]

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Bibliography

[1] Someone. *A Book Title.* A Publisher, A City, Place, 1990.