

# Matthew Rossetter

## *Curriculum Vitae*

🏠 Easter Banknock, Denny, FK6 5NA  
☎ +44 7446 949025, DoB: 26/10/1998  
✉ mbr-physics@protonmail.com,  
matthew.rossetter@durham.ac.uk  
🌐 <https://github.com/mbr-physics>

## MASTERS THESIS

### “CP Violation In And Beyond The Standard Model”

In the preliminary report, we test the Two Higgs Doublet Model (2HDM) of Type II as an extension of the Standard Model (SM) using indicative flavour observables, with particular focus on leptonic decays of  $B$  and  $D$  mesons,  $B\bar{B}$  mixing, and the  $b \rightarrow s\gamma$  radiative decay. Testing the 2HDM parameter space  $m_{H^\pm}$ ,  $\tan\beta$  to find alignment between theoretical calculations and experiment, constraints on the parameters were found for the above flavour phenomena both individually and then as a global fit. Strongly dominated by the  $b \rightarrow s\gamma$  branching ratio, the mass of a charged Higgs particle would be expected to lie between 370 GeV and 891 GeV. The 2HDM vacuum expectation value ratio  $\tan\beta$  is calculated to lie between 2.16 and 33.0. Discussions on the goals of the study from here are ongoing, likely a further study into the 2HDM and its validity as a SM extension.

## EDUCATION

### 2016 – PRESENT Master of Physics

#### STATEMENT OF MARKS:

- THIRD YEAR - 2:1 (69%)
- SECOND YEAR - 1ST (77%)
- FIRST YEAR - 1ST (72%)

Theoretical Physics  
*University of Durham*

### 2009 – 2016 Secondary Education

- Advanced Highers - A in Physics, Maths, Chemistry, and English
- Highers - A in Physics, Chemistry, Biology, Maths, and English
- National 5s - 7 As and 1 C including Maths, Physics, and English at A

*The High School of Glasgow*

## ACADEMIC EXPERIENCES

### *Quarkonia Modelling*

Throughout my degree course, I have had several coursework projects that have required extensive Python programming, thus far leading up to the year-long project in my Third Year, where I modelled the early (n,l) wavefunctions for a Hydrogen atom, and then applied this to Quarkonia phenomena. I was able to calculate good approximations for several lower state masses, with the inclusion of hyperfine splitting. A full repository of this study can be found in my [github profile](#).

### *Python Tutoring*

As part of my fourth year, I have volunteered to help as a tutor in First Year programming workshops, assisting in teaching the new students the fundamentals of Python programming for physics. I put my knowledge of Python to good use in sharing it with newer students, and this has allowed me to gain a better understanding of the language in teaching it.

## AWARDS

- 2019 President's Vote of Thanks, and Full Colours  
*St Mary's College, Durham University*
- 2018 BIIAB Level 2 Award for Personal License Holders
- 2017 RLSS National Pool Lifeguard Qualification
- 2016 British Red Cross Emergency First Aid and ITC Outdoor First Aid
- 2015,16 National Finalist and Company President at UK Space Design Competition
- 2014,15 CREST Bronze & Silver Science Awards

## COMPUTER SKILLS

BEGINNER	Perl, HTML, Fortran
INTERMEDIATE	C++, Microsoft Office
EXPERT	Python, Unix, $\LaTeX$

## SKILLS

### *Critical Thinking*

I am able to conceptualise and analyse complex ideas and concepts. It is an important part of any role, particularly in science, to perceive the merits and flaws of a system and comprehend how to optimise this based on the information provided. One must also know when a system is flawed and must be reviewed.

### *Goal Oriented and Dedicated*

Understanding tasks properly is important to me. Performing these tasks properly is important to the efficient running of a workspace. I use my judgement to act and achieve goals quickly and efficiently. As part of a workplace, I dedicate myself fully to the task at hand. Focusing on what task needs done and putting the full effort needed towards its completion results in a better job being performed.

### *Passionate*

I have been interested in theoretical physics such as quantum mechanics and particle phenomenology from an early age. My education and research have cemented this interest into a passion. I greatly enjoy carrying out fundamental physics research with potential experimental implications.

### *Communication Skills and Collaborative Working*

I have spent a lot of time working in customer service and enjoy interacting with people of all backgrounds. I have learned how to work together with other people to achieve a goal, and adapt to many working environments to best make use of my resources.

## WORK EXPERIENCE

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CURRENT, FROM OCT 2018 (PT)

Freemans Quay Leisure Centre  
**Casual Leisure Assistant/Lifeguard**

The challenge of being a lifeguard is in the potential for life-or-death situations. As a lifeguard, I present a positive leisure experience, which focuses on dealing with any customer issues and maintaining an enjoyable environment for all. This must be balanced with constant vigilance over the pool area in case of the need for intervention or rescue, with the proper knowledge and ability to save any lives that may be at risk.

CURRENT, FROM OCT 2017 (PT)

St Mary's College Bar  
**Bar Staff**

I am responsible for serving and interacting with customers. This requires developing keen social skills to balance a friendly atmosphere for customers with a presence of authority to those who may cause trouble. It is important to maintain a high level of cleanliness in a frequently messy environment, and keep a mind for potential welfare issues such as binge drinking which must be monitored and reported.

SEP 2018 – JULY 2019 (PT)

St Mary's College Bar  
**Bar Steward**

Over the academic year 18/19, I was in charge of the college bar with duties such as stock control, staff hiring and training, shift assignment, and maintenance and cleaning. I was selected for my strong work ethic and commitment to the role, and developed skills into this management role to improve the college bar to bring in more customers, creating a safer and more efficient working environment for staff. When managing staff who were also my peers, it was important to find the proper balance in the workplace so I would be taken seriously in my role as their manager.

## REFERENCES

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**Dr. Alexander Lenz**

POSITION Professor  
EMPLOYER *Institute for Particle Physics Phenomenology  
University of Durham*  
EMAIL alexander.lenz@durham.ac.uk  
PHONE +44 (0)191 3343814

**Dr. Qing (Helen) He**

POSITION Assistant Professor  
EMPLOYER *Centre for Materials Physics  
University of Durham*  
EMAIL qing.he@durham.ac.uk  
PHONE +44 (0)191 3343812

**Mustafa Gun**

POSITION Food and Beverages Services Manager  
EMPLOYER *St Mary's College  
University of Durham*  
EMAIL mustafa.gun@durham.ac.uk  
PHONE +44 (0)191 3345920