UNIVERSITY OF LEEDS

My Project Title

Your Full name

University of Leeds

School of Physics and Astronomy

Supervisor: Prof. M.Y. Supervisor

Submitted in accordance with the requirements for a research project for the degree of

Combined Bachelor of Science and Master of Physics

April, 2024

Declaration of Academic Integrity

I am aware that the University defines plagiarism as presenting someone elseâ€™s work, in whole or in part, as your own. Work means any intellectual output, and typically includes text, data, images, sound or performance.

I promise that in the attached submission I have not presented anyone elseâ€™s work, in whole or in part, as my own and I have not colluded with others in the preparation of this work. Where I have taken advantage of the work of others, I have given full acknowledgement.I have not resubmitted my own work or part thereof without specific written permission to do so from the University staff concerned when any of this work has been or is being submitted for marks or credits even if in a different module or for a different qualification or completed prior to entry to the University. I have read and understood the Universityâ€™s published rules on plagiarism and also any more detailed rules specified at School or module level.I know that if I commit plagiarism I can be expelled from the University and that it is my responsibility to be aware of the Universityâ€™s regulations on plagiarism and their importance.

I re-confirm my consent to the University copying and distributing any or all of my work in any form and using third parties (who may be based outside the EU/EEA) to monitor breaches of regulations, to verify whether my work contains plagiarised material, and for quality assurance purposes.

I confirm that I have declared all mitigating circumstances that may be relevant to the assessment of this piece of work and that I wish to have taken into account.I am aware of the Universityâ€™s policy on mitigation and the Schoolâ€™s procedures for the submission of statements and evidence of mitigation. I am aware of the penalties imposed for the late submission of coursework.

Signed : _____ Date_____

Your Full name

Acknowledgements

Thanks everyone.

Abstract

C60 is pretty awesome for many reasons.

Contents

List of Figures

List of Tables

Abbreviations

AC	Alternating Current	PCAR	Point Contact Andreev Reflections
BCS	Bardeen-Cooper-Schrieffer	MR	Magnetoresistance
DC	Direct Current	FET	Field Effect Transistor
FWHM	Full Width Half Maximum	UHV	Ultra High Vacuum

Chapter 1 : Introduction

Thesis writing is lots of fun.

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ac turpis egestas maecenas pharetra. Ultrices dui sapien eget mi proin sed libero. Pretium vulputate sapien nec sagittis aliquam malesuada. Turpis egestas maecenas pharetra convallis. Sed risus ultricies tristique nulla. Vulputate enim nulla aliquet porttitor lacus luctus accumsan tortor posuere. Mi sit amet mauris commodo quis. Purus semper eget duis at tellus at urna. Sit amet purus gravida quis blandit. Eleifend quam adipiscing vitae proin sagittis nisl rhoncus. At imperdiet dui accumsan sit amet nulla facilisi morbi. In arcu cursus euismod quis viverra. Sed adipiscing diam donec adipiscing. Euismod lacinia at quis risus sed vulputate odio ut enim. Nulla malesuada pellentesque elit eget gravida. Proin libero nunc consequat interdum varius sit amet mattis vulputate. Donec enim diam vulputate ut pharetra sit.

Varius morbi enim nunc faucibus. Eget duis at tellus at urna condimentum. Aliquam id diam maecenas ultricies mi eget. Eget velit aliquet sagittis id consectetur purus ut faucibus pulvinar. In vitae turpis massa sed elementum tempus egestas. Massa placerat duis ultricies lacus. Ut etiam sit amet nisl purus in mollis nunc sed. Faucibus vitae aliquet nec ullamcorper sit amet risus nullam. Aenean sed adipiscing diam donec. Volutpat sed cras ornare arcu.

Sed augue lacus viverra vitae congue eu consequat ac felis. Viverra adipiscing at in tellus integer. Sed pulvinar proin gravida hendrerit. Non tellus orci ac auctor augue. Suspendisse sed nisi lacus sed viverra tellus. Cum sociis natoque penatibus et. Nibh tortor id aliquet lectus. Egestas erat imperdiet sed euismod nisi. Magnis dis parturient montes nascetur ridiculus. Sit amet mattis vulputate enim nulla aliquet porttitor. Enim ut tellus elementum sagittis vitae et. Amet commodo nulla facilisi nullam vehicula ipsum. Viverra vitae congue eu consequat ac felis. Mattis enim ut tellus elementum sagittis vitae et. Velit laoreet id donec ultrices tincidunt arcu. Amet facilisis magna etiam tempor orci. Eu tincidunt tortor aliquam nulla facilisi cras fermentum odio. Eu scelerisque felis imperdiet proin.

Etiam tempor orci eu lobortis elementum nibh tellus. Mattis enim ut tellus elementum sagittis vitae et. Cras adipiscing enim eu turpis egestas pretium aenean pharetra. Risus sed vulputate odio ut. At auctor urna nunc id cursus metus aliquam eleifend

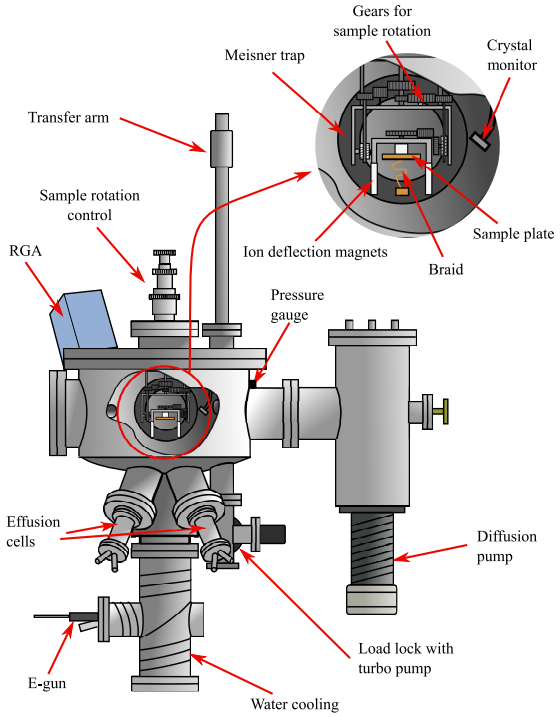

Figure 1.1: An example of how to place a figure with a caption and a lebel that you can use to cross reference the figure. Don't forget to cist the source of copied figures [1] and put the label after the caption to make the cross referenced figure number correct.

mi. Facilisi morbi tempus iaculis urna id volutpat. Cras adipiscing enim eu turpis egestas. Volutpat blandit aliquam etiam erat velit scelerisque in. Eu nisl nunc mi ipsum faucibus vitae aliquet nec ullamcorper. Tortor aliquam nulla facilisi cras fermentum odio. Commodo sed egestas egestas fringilla. Vulputate ut pharetra sit amet aliquam id. Ac tortor dignissim convallis aenean et tortor at risus viverra. Ridiculus mus mauris vitae ultricies leo integer. Suscipit adipiscing bibendum est ultricies integer quis auctor elit sed.

Always make sure that every figure is referred to in the text. Here, for example, figure 1.3 shows one of our instruments. Tables work just like figurwes - see table 1.1 for example

Non quam lacus suspendisse faucibus interdum posuere lorem ipsum dolor. Eu nisl nunc mi ipsum faucibus. Justo eget magna fermentum iaculis eu. Lacus suspendisse faucibus interdum posuere lorem. Fusce ut placerat orci nulla pellentesque dignissim enim. Vitae proin sagittis nisl rhoncus mattis rhoncus. Commodo nulla facilisi nullam

Country List			
Country Name or Area Name	ISO ALPHA 2 Code	ISO ALPHA 3 Code	ISO numeric Code
Afghanistan	AF	AFG	004
Aland Islands	AX	ALA	248
Albania	AL	ALB	008
Algeria	DZ	DZA	012
American Samoa	AS	ASM	016
Andorra	AD	AND	020
Angola	AO	AGO	024

Table 1.1: Tables are always a git of a pain in LaTeX 2_ε- but here is an example table taken from https://www.overleaf.com/. Make sure the label goes after the caption for figures and tables!

vehicula ipsum. Nunc sed velit dignissim sodales ut eu. Elit pellentesque habitant morbi tristique senectus et netus et malesuada. Enim sit amet venenatis urna cursus. Phasellus vestibulum lorem sed risus ultricies. Magna eget est lorem ipsum dolor. Nulla aliquet porttitor lacus luctus accumsan. Vitae et leo duis ut. Nec tincidunt praesent semper feugiat nibh sed pulvinar proin gravida. Phasellus faucibus scelerisque eleifend donec pretium vulputate sapien nec. Amet risus nullam eget felis eget. Sodales ut etiam sit amet. Nisl condimentum id venenatis a. Neque viverra justo nec ultrices dui.

Vitae aliquet nec ullamcorper sit amet risus nullam eget felis. Egestas egestas fringilla phasellus faucibus scelerisque eleifend donec pretium. In est ante in nibh mauris cursus. Cursus in hac habitasse platea dictumst quisque sagittis. Orci ac auctor augue mauris augue neque gravida. Nullam ac tortor vitae purus faucibus ornare suspendisse. Diam donec adipiscing tristique risus nec feugiat in. Leo vel fringilla est ullamcorper eget nulla facilisi etiam. Eu augue ut lectus arcu bibendum at. In fermentum posuere urna nec tincidunt praesent. Ornare quam viverra orci sagittis eu volutpat odio. Pellentesque habitant morbi tristique senectus et.

Lorem ipsum dolor sit amet. Ipsum dolor sit amet consectetur adipiscing elit. Tortor vitae purus faucibus ornare suspendisse sed nisi lacus. Quis enim lobortis scelerisque fermentum dui faucibus in ornare quam. Turpis egestas sed tempus urna. Id nibh tortor

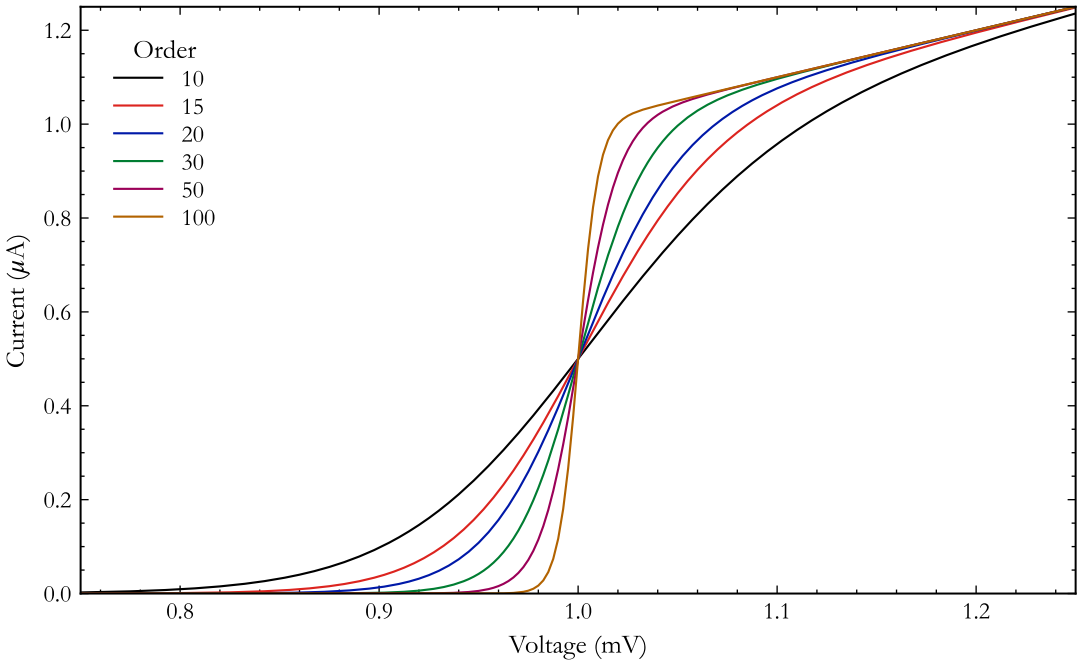

Figure 1.2: If you are making figures with Python, then I strongly recommend that you use the **stonerplots**[2] package. It has a "thesis" style that is set up for this template.

id aliquet. Sed tempus urna et pharetra pharetra massa. Sit amet mauris commodo quis imperdiet. Sed felis eget velit aliquet sagittis id. Id diam maecenas ultricies mi eget mauris. Aliquet nec ullamcorper sit amet risus nullam eget felis. Nascetur ridiculus mus mauris vitae. Ultrices vitae auctor eu augue ut lectus. Dolor sed viverra ipsum nunc aliquet. Consequat ac felis donec et odio pellentesque diam volutpat commodo. Fermentum dui faucibus in ornare. Blandit massa enim nec dui nunc mattis. Dictum varius duis at consectetur lorem donec massa sapien. Sed arcu non odio euismod lacinia at quis.

Aliquam vestibulum morbi blandit cursus risus at ultrices. Euismod nisi porta lorem mollis aliquam ut. Pellentesque nec nam aliquam sem et tortor. Nunc sed augue lacus viverra vitae congue eu consequat ac. Feugiat nisl pretium fusce id velit ut. Dolor magna eget est lorem ipsum dolor sit. Faucibus ornare suspendisse sed nisi lacus sed viverra tellus. In nulla posuere sollicitudin aliquam. Habitant morbi tristique senectus et netus et malesuada. Tempor id eu nisl nunc mi ipsum faucibus vitae. Posuere morbi leo urna molestie at elementum. Euismod quis viverra nibh

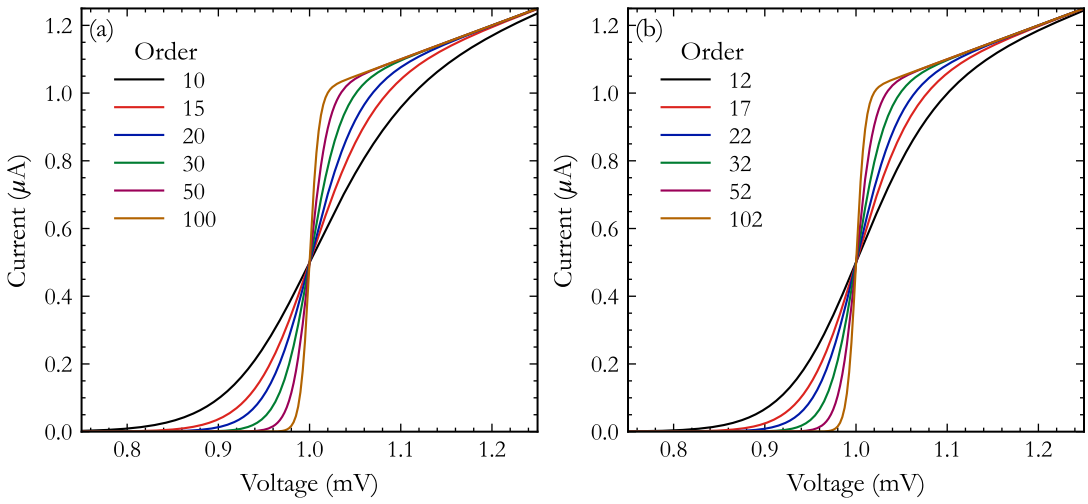

Figure 1.3: Double panel figures are also easily made with the **stonerplots**[2] packae. and the MultiPanel context manager.

cras pulvinar mattis. Egestas pretium aenean pharetra magna ac placerat. Sit amet volutpat consequat mauris nunc congue nisi vitae suscipit. Vel pharetra vel turpis nunc eget lorem dolor. Id consectetur purus ut faucibus pulvinar elementum.

Volutpat maecenas volutpat blandit aliquam etiam. Magna fringilla urna porttitor rhoncus dolor purus non enim praesent. Ornare quam viverra orci sagittis. Consequat id porta nibh venenatis cras sed felis eget velit. Amet consectetur adipiscing elit ut aliquam purus sit. Ultrices tincidunt arcu non sodales neque. Vitae congue mauris rhoncus aenean vel elit scelerisque. Nunc faucibus a pellentesque sit amet porttitor. Faucibus vitae aliquet nec ullamcorper sit amet risus. Fringilla urna porttitor rhoncus dolor purus non enim praesent. Diam maecenas ultricies mi eget mauris. Amet aliquam id diam maecenas ultricies. Massa enim nec dui nunc. Tempor nec feugiat nisl pretium fusce. Risus nullam eget felis eget nunc. Sed odio morbi quis commodo odio. Porttitor massa id neque aliquam vestibulum morbi blandit cursus. Vitae tempus quam pellentesque nec nam aliquam sem.

At ultrices mi tempus imperdiet nulla malesuada. Cum sociis natoque penatibus et magnis. Mattis pellentesque id nibh tortor id aliquet lectus proin nibh. Facilisis volutpat est velit egestas dui id ornare arcu. Cras ornare arcu dui vivamus arcu felis bibendum. Senectus et netus et malesuada. Nunc mattis enim ut tellus. Eu mi bibendum neque egestas congue quisque egestas diam in. Mattis nunc sed blandit

libero. A cras semper auctor neque vitae tempus. Porttitor eget dolor morbi non arcu. Magna ac placerat vestibulum lectus mauris ultrices. Vulputate sapien nec sagittis aliquam malesuada bibendum.

Chapter 2 : Material not in a chapter

This is the first appendix.

2.1 Bits of LaTeXadvice

1. Do look at the output log and try to understand any errors - they are sometimes important!

2. In the final pdf, do a search for ? - it is what LaTeXwill give when a reference is missing. Having missing references in your submitted thesis is, at best, embarrassing and potentially a failing matter.

3. A good quality bib file is important - make sure that entries are consistent in whether journals are abreviated, capitalised and how Author names are presented. A good way to do this is to use Mendeley to import your bib file and then use its doi lookup feature which will re-write your bibliogrpahy entries in a standardised form. You then export the bibliography back oit as a bib file.

4. Be particularly careful about older papers where the doi may not be easy to track down. Also watch out for JETP Letters that you are being consistent in citing the English language version (or the Russian, but don't mix and match!)

5. Although LaTeXguides may show you how to assemble a multi-part fgure from within LaTeX, it can be hard to make sub-plots appear exactly the same size. We recommend using something like Inkscape to assemble the parts of a figure and lay them out nicely. Be careful if saving to pdf files thatr the fonts are preserved - otherwise you can lose greek symbols.

6. If preparing figures in Origin, set the plot size to be exactly the right size or exactly double size and then scale fonts and symbols accordingly. Use Origin's ability to copy formatting between graphs to make everything nicely consistent (e.g. frame sizes, thicknesses, coolour schemes, point sizes and shapes).

7. In general resist the temptation to put [H] when placing figures and tables - in most cases it is better to let LaTeXwork out where to put things. It can get tricky if you have a lot of figures one after another (perhaps a single multi-part figure

is what you need?) - the placement option [p] can alos help to move floats to a separate page of figures. See also the *afterpage* package.

References

[1] J. T. Batley, *Spin Transport in Lateral Spin Valves*. PhD thesis, University of Leeds, 2015.

[2] G. Burnell, "StonerPlots Python Package," Apr. 2024.