

## Hints for Writing the Doctoral Dissertation within the Doctoral Programme Physics and Materials Science

The doctoral dissertation summarises the results of your scientific work and puts it into context and into perspective.

Before you start writing answer the following questions:

- what are the new insights generated by my work?
- why are they important?

Write down the answers to these questions. These are the messages you want to convey through your dissertation.

The dissertation must contain the following parts:

- **Cover Page:** you receive the official cover page from the doctoral candidates' office (BED).
- **Abstract:** it summarises the scientific background on which your work is founded and highlights your main findings. It should not be longer than 1 page.
- **Table of contents:** this is usually after the abstract.
- **Introduction:** this is a brief explanation of the scientific questions you want to answer. It often gives a general background to the topic. It explains the significance of your work. Why is it important? Why should the reader be interested? At the end of the introduction often an overview of the structure of the dissertation is given.
- **Background:** you describe the knowledge and insight that was already there when you started your doctoral work, or that developed during your work, but independently from your own work. It gives the state of the art, upon which you build and which you move forward through your work. Make sure you cite everything correctly, you mark clearly every figure or text taken from a source. In your background section, it is often necessary to refer to textbook knowledge. Try as much as possible to explain everything in your own words. But make it clear that you are referring to textbook knowledge. Ideally you cite the textbooks that you have used.<sup>1</sup> In your background section you discuss only subjects and correlations that you need for your own work. Don't try to write another textbook.  
It is important that the background is clearly separated from your results. It should be clear to the reader what is the state of the art you build on and what are your own results.
- **Results:** this is obviously the main part of your thesis. Here you write what you have done and how, what results you obtained, how these results present a step forward in science. You clearly describe your own ideas. What is important to note is that results

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<sup>1</sup> e.g. like that "The following discussion summarises the description given in ref 1 and 2"

are more than the description of observations. Results are (experimental, computational, or theoretical) observations with an interpretation, a modelling, a presentation of its relevance and context. In this section you also describe clearly how you obtained your results: how did you do the measurements or calculations. These descriptions should be detailed enough for somebody with the corresponding knowledge to be able to repeat your measurements or calculations. Your results must present progress with respect to the state of art (therefore it is important that you give a clear and comprehensive presentation of the state of the art in the background section). It can be useful to separate the presentation of your observations (the raw experimental or computational facts) from the discussion (which is the interpretation of your observations).

Usually, your results are presented in several sections. Each section should finish with a summary of this part, i.e., a clear statement what was learned from the results presented in this section.

Different styles are possible, depending on how interrelated your results are: you can write one big background chapter and one big results chapter or separate the results in different (somewhat independent) sections and place the background at the beginning of each section. In the latter case, the background and the results should be in different sub-sections.

- **Summary and Conclusion:** at the end you summarise your results, presenting clearly how they go beyond the state of the art. Ideally you integrate your results and present the new version of the state of the art. Usually this is followed by an outlook, where you present open questions or further developments that follow from your work.
- **References:** this is a list, usually numbered, that gives all the references you refer to in the text.
- **Acknowledgement:** this is an important part of your thesis. It is not only polite to thank everybody who has helped you during your dissertation work, but it is also important to state which measurements or calculations were not done by yourself but by somebody else. If you show a result and do not mention anybody who did it for you, you claim implicitly that you have done it yourself – which will in fact be the case for most of your results.
- **Publication list:** Here you list the papers you have published as a first author and as co-author. You list your contributions to international conferences. Or you list the patents which you have filed during your dissertation work.
- **Annexes:** sometimes you have results for which you don't have a clear interpretation or which don't fit into the story you want to tell but should still be presented. They can go into an annex. A detailed description of a measurement set-up or a computer programme would also go into an annex.

A typical size of a doctoral dissertation (without annexes) is 150 pages or 50.000 words. This is just an average, anything between 100 and 200 pages is reasonable.

When you write, have your audience in mind: the most likely person (besides the jury) to read your dissertation in detail is your successor. Write it for them.

### **Cumulative dissertation:**

We do recommend writing a dissertation. It's probably the only time in your life where you write a real monograph. It can be a very valuable document for the next doctoral students and young postdocs. But it is possible to submit a cumulative dissertation, if you have at least three first-author papers.

In this case, you write an **abstract**, as detailed above, followed by a **table of contents**. Then, you need to write a **detailed introduction**, which summarises and puts into context the background and the results of all the papers. For each paper, you need to clearly write what was **your contribution** to the paper. You still need to write a **summary and outlook**, followed by **acknowledgements** and **publication list**.

### **Plagiarism and self-plagiarism:**

All materials (books, publications, patents, web pages, etc.) that you use for your thesis have to be correctly cited. Whenever you take text verbatim from these or other sources, it must be in quotation marks, and the source has to be referenced. Before the thesis defense, all manuscripts will be submitted to an automatic plagiarism test through a specific software chosen by the University (currently Ithenticate).

The same rules apply when you use material from our own publications in your thesis: to avoid self-plagiarism, it is best to rephrase the text. Otherwise, you must put the text in quotation marks. In both cases, it has to be mentioned that the text is taken from a publication and this publication must be referenced.

More information on Plagiarism can be found on the DPPM webpage.

We wish you all the best for your research and for your dissertation writing.