Ferrofluid oscillator: Writing the report

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Overview

In addition to the experimental work with the ferrofluid oscillator you will write a report. Parts of the report (such as Introduction and Theory) can be written before the experimental work.

Experimental work, is done as group work. The group members decide beforehand who writes the report. The author will have three weeks to write the first version of the report, after which it will be graded and commented, and you will schedule a meeting with assistant to receive the feedback. Then you will have two weeks to modify the report if you want, and the final version is graded. The grades are in 0-10 scale, and the final grade is the average of the grades of the two reports.

Before writing the report, read the material available in MyCourses. You are also encouraged to find additional information yourself.

If you have any questions relating to writing the report, do not hesitate to contact the assistant. This can be done through MyCourses or e-mail (fereshteh.sohrabi@aalto.fi).

Writing the Report

The report should be an accurate and compact presentation of the experimental work, data analysis, results and conclusions drawn from them. Experimental work should be described in a way that the reader understands what has been done and why, without prior knowledge of the work. The results should be clearly presented, preferably as figures or tables. Information sources (articles etc.) must be referenced.

Before writing the report, make sure you understand what you are going to write about. Read the lab work instructions, the article about ferrofluid oscillator and the Matlab functions (all of which can be found in MyCourses). However, do not copy text directly from these or any other source! Attempted plagiarism will have consequences. Furthermore, every information source must be mentioned in the References section.

You must return your report in PDF format by email in **three weeks**. This time can be extended for **valid reasons** (sickness etc.). The report must be written in English language. After grading the assistant will meet with the author to give short feedback on the report.

The content of the report is more important than its length! The recommended length is around 10 pages without appendices, depending on the number of figures etc. Consider what details are important and what can be left out.

Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away.

- Antoine de Saint Exupéry

Structure of the Report

The structure of the report is not set in stone. You can for example decide to divide *Measurements* section in two: *Experimental setup* and *Measurements*, or to combine *Introduction* and *Theory*. In any case the report should contain the following information:

Cover

A page containing the basic information about the lab work: course, name of the work, name of the assistant, names of the students, date of the measurements and the date when the report was returned.

Introduction

Introduction is a short summary of the work and its background. You should give an overview on the subject-matter: tell briefly about superhydrophobicity (definition, applications, etc.) and oscillatory measurements in general (where else are they used?). Describe the working principle of the ferrofluid oscillator and explain clearly the motivation for the measurements.

Theory

Explain the basic theory relating to superhydrophobicity, droplet oscillations and dissipative forces, but do not go into too much detail. Describe what kind of results are expected based on the theory. Present the most important equations (and number them), but skip the derivations.

Measurements

Describe the measuring system and how the measurements were performed, but skip the details. However, give detailed information on your measurement parameters (distance between the magnet and the droplet etc.). The idea is that the reader is in principle able to repeat your work based on this information.

Results

Describe how the measurements were analyzed to achieve the results (reference the equations in the theory part). Present the results (F_μ as a function of I, β as a function of A) as clearly as possible. For example, you can plot the mean values of F_μ for each I with error bars representing standard deviation (see functions *mean*, *std* and *errorbar* in Matlab). If you did linear fitting, present the slope. Estimate the (random) error in the results.

Conclusions

Examine your results critically: What do they indicate? How reliable are they? Consider possible sources for systematic errors (this can also be done in the *results* section). If your results seem flawed, try to think what went wrong. Consider also the theoretical assumptions made in this work (there are quite a few of them). Are they valid? How can they affect the results? And so on.

In the end you can describe how the measuring system and/or theoretical model could be improved. You can for example think about the resonant method described in the article. Does it have any benefits compared to the free decay measurements performed in this work?

References

Each information source used in the report should be referenced with a number. This section includes a numbered list of those sources, so it is easy to check where the information was obtained.

Appendix

Additional information not suitable in the actual text fits here. In this work appendix should contain the calibration picture (with the calibration constant) and figure of each oscillation fit (produced by *AnalyzeCoordinates*). Include also the distance between the magnet and the droplet with each figure.

The most important parts of the report are the results and conclusions. Focus on those!

Do not hesitate to contact the assistant if you have any questions. You can do this either through MyCourses or e-mail (fereshteh.sohrabi@aalto.fi). Feel free to give feedback, even before completing the report. All feedback, both positive and negative, is appreciated and will not affect your grade in any way!