Title of the document

TU Delft, Faculty of Applied Sciences,
BSc program Applied Physics

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Abstract

The report starts with a Samenvatting (Abstract). The abstract should be self-contained, i.e. a reader should be able to fully understand it without any prior knowledge about the research. Also, in the abstract there should be no references to (figures, tables, formulas etc. in) the remainder of the report, nor to the literature. The abstract tells the reader:
(1) which research question has been studied,
(2) what the research method/approach was,
(3) which results have been obtained, and
(4) what the main conclusions were.

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1 List of symbols

bla bla bla bbb

2 Introduction

TheInleiding (Introduction) describes: -The research question. (Be as precise as possible. Not: “We investigate on which parameters the bubble behaviour depends”, but “we study the relationship between the path of bubbles at a microfluidic T-junction, and the velocity and length of those bubbles).
-The relevance of the research question (for science and/or technology).
-The state-of-art: what is already know? (including references to prior literature).
-A brief description of the research method/approach.
-A brief description of the structure/contents of the rest of the report.
The introduction should be self-contained, without reference to the manual or to the remainder of the report, and should be understandable to readers who know nothing about the research.

3 Theory

In theTheorie (Theory) chapter, you describe all (and only!) the theory needed to understand and interpret the experiments in the remainder of the report. Explain to the reader why a piece of theory is relevant for your research. Equations should be numbered. If an equation cannot be assumed to be generally known by the readers (see General Hint 2 for the level of the audience), you should provide a reference to an accessible textbook or article (so not to the RP manual, lecture notes, Wikipedia etc.). In general, try to avoid referring to websites, online data or Wikipedia.

4 Experimental method

TheExperimentele opstellingor Experimentele methode (Experimental set up or Experimental method) chapter describes the experimental setup and the experimental methods used in sufficient detail such that a reader can judge the soundness and, in principle, may verify the conclusions of your research. Also, this chapter should be informative for a reader who wants to perform similar research. Preferably use clear sketches of the setup, rather than photographs. In this chapter you also describe the accuracywith which direct observables have been measured, and the accuracy of the important deduced quantities. Detailed accuracy calculations should be put in an Appendix

5 Results and discussion

In theResultaten en discussie (Results and discussion) chapter, you present your results, generally in the form of graphs, and you discuss them. A single small table (m aximum 10 rows x 5 columns) is acceptable, but large tables should be in an appendix. In deviation from what many students believe, it is not desirable to separate the presentation and the discussion of results from each other. In professional literature, this is most often done together.

•You should introduce each graph:

-Why has this graph been included in the report. (What do we want to learn from this graph?).

-Why have you plotted this Y-axis variable as a function of this X-axis variable (which theoretical/expected relationship is tested/demonstrated in this this graph?

•Then you tell the reader what (according to you) he/she should see in the graph, limiting yourself toconclusions that are relatively indisputable. The more speculative conclusions should be in the next chapter.

5.1 Resolving power

The photos of the resolution target (of which figure 1 is a example) were shot with the NI Vision software present on the computer we used, using this software we were able to directly create datasets for the linetraces over several groups. This meant that we had no extra artifacts from compression of the photo files. The data was exported as a comma-seperated data file. After trimming the data we used a simple python program to parse the data. The resulting figures were easily readable. One of these figures is shown below in figure 2

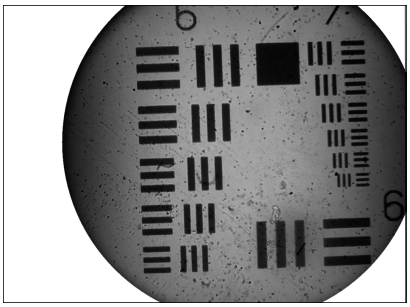

Figure 1: Black and white photo.

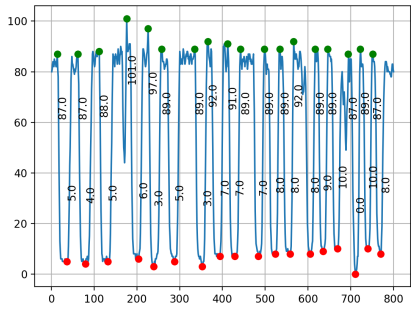

Figure 2: Linetrace of seventh group.

The high an low values of the line trace were manually read of the photos and entered into a python script capable of calculating the visibility values for each numerical aperature and spatial frequency. The result of which can be seen in figure 3.

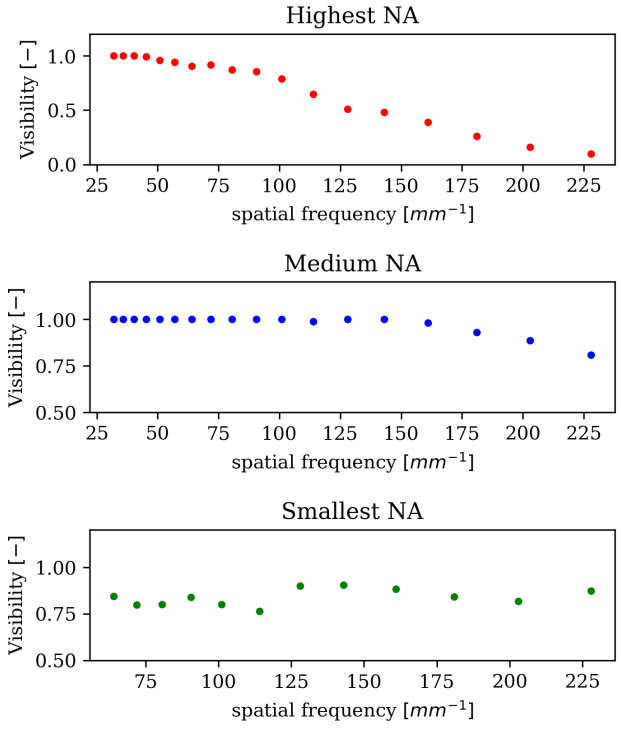

Figure 3: Plots of the visibilities per numerical aperature.

The data is plotted in such a way that the highest subplot has the highest numerical aperature and the lowest subplot has the lowest numerical aperature. Each subplot has the dimensionless visibility number plotted on the vertical axis and the spatial frequency plotted on the horizontal axis. We chose this layout since we expect the visibility to decrease when the lines get closer together and the spatial frequency thusly increases. Note that only the verticle visibility axis of the highest subplot starts with a visibility of zero.

What we see is not surprising when we also take into account the photos in the appendix. As can be seen on these photos the smallest numerical aperature lense has the highest magnification, therefore all three traced groups are clearly resolvable. Thus the visibility won't drop as much as the highest aperature lense when the spatial frequency increases.

Something noticable however is that the smallest numerical aperature plot starts of with the lowest visibility value. This has to do with the fact that this smaller aperature aslo catches less light, the brightest spot in its photo is evidently less bright than that of the other two aperatures. This can be seen when taking a look at either the lintraces or the photos in the appendix.

6 Conclusions

In theConclusies (Conclusions) chapter
-You give a clear and concise answer to the research question that was formulated in the Intrduction
-You discuss to what extent, and why, your findings do (not) agree with theory/expectations/earlier work, you discuss more speculative conclusions, ad you may do suggestions for further (improved/extended) research.The Conclusions should be self-contained and understandable for readers that have only read the introduction (and have not read the rest of your report, do not know the literature, do not know the experimental setup and have not read the RP manual). In the Conclusions chapter, you may not make references to graps, tables, equations etc. in the remainder of the report.

References