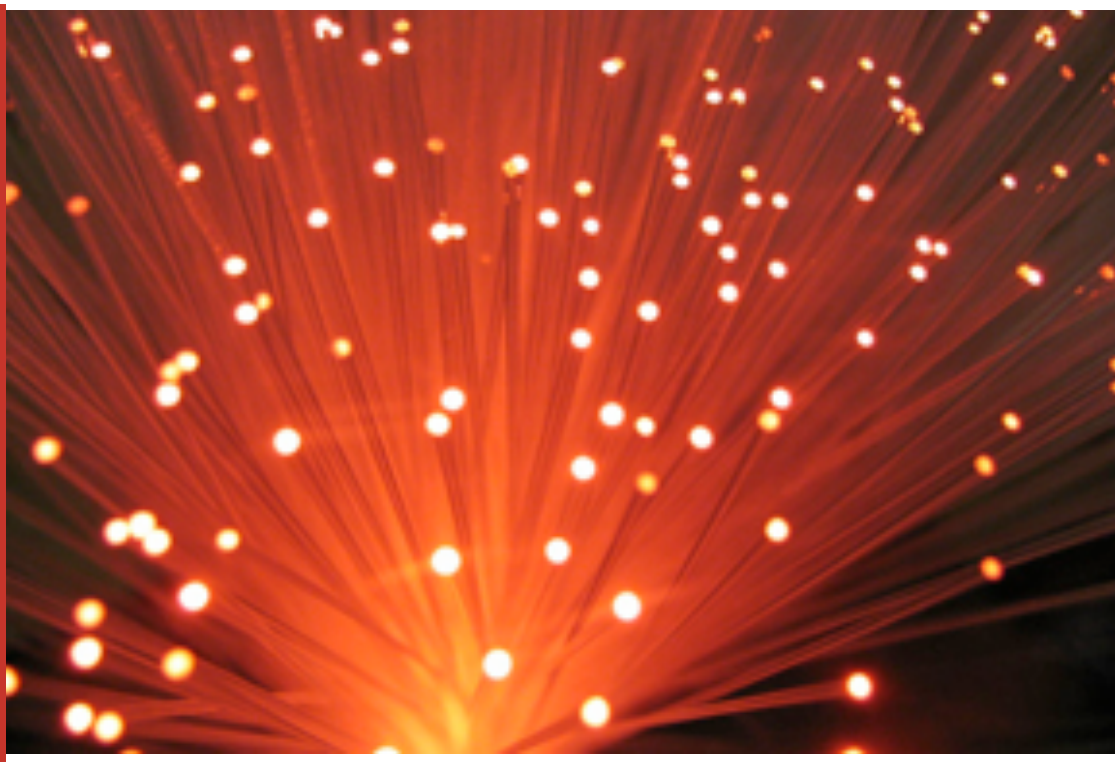
UCA Department of Physics and Astronomy

PHYS 3345: OPTICS



Be sure to check the course calendar for experiment dates and lab report due dates. Dates may change subject to equipment availability and space constraints.

Lab Report Format and Information
Spring 2008

You are required to participate in and report on two laboratory experiments. The experiments will be set up for a limited period of time, and it will be your responsibility to complete the experiment during this window of opportunity. Failure to participate in the experiments will result in a grade of zero for the lab report. You may not report on data collected by someone else; your report must be your own original writing based on your own original experimental data.

It is *possible* that there may be three experiments ready to perform during the semester. If this becomes the case, you will still only be required to write a pair of lab reports. In the event that a third experiment becomes possible, you will be allowed to select which two of the three experiments to perform. Specific details for each experiment will be posted on the course web.

The due dates for each report will be determined by the date of experiment. You will have two weeks subsequent to the experiment in which to prepare your report. Please consult the course calendar for the specific dates, and be aware that dates may change subject to equipment availability or space constraints.

You should manage your time in a way that permits you to have a draft report proofread by me. You will obviously get the best results if you bring a draft in and receive specific suggestions for corrections and/or improvements in advance of submitting your final report. No late reports will be accepted. You are responsible for knowing and meeting your due dates.

The report should follow a fairly standard format for scientific papers. Small variations in format may be tolerated, but wild deviations from generally accepted format will incur point penalties. You should prepare a professional-looking report. Use a standard font that is clear and easy to read. Please do not over- or under-size your font (10pt ≤ size ≤ 12pt). You do not need to double-space, but leave 1-inch margins for comments. Your report should include the following sections:

Abstract

This should be a very brief paragraph. It should concisely explain or describe the purpose of the experiment and the results. Brevity is important, but remember that the purpose of an abstract in a scientific journal is to give the reader sufficient information to determine whether he or she needs to read the entire article.

Introduction

You should use this section to introduce the reasons for performing the experiment, as well as the underlying physics. It may be appropriate here to include a brief description of the history of the experiment or the physics.

Procedure

If you have designed and built your apparatus from scratch, then a step-wise description of the equipment and its proper use is appropriate. If you are using apparatus that is standard, then a detailed list of instructions is neither necessary nor appropriate. If you have modified a piece of existing equipment, or have developed a way to use an instrument that is beyond the scope of the manual, then it becomes critical for you to describe what you have done in detail. Any malfunctions, breakdowns, or work-arounds should be noted and explained thoroughly.

When necessary, you should include diagrams and/or sketches for clarity. It may be helpful for you to document your procedure digitally. If you do not have a digital camera, you will be allowed to use the Department's camera (subject to availability). Your digital images may be included in your report, or they

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may simply be useful to you as you prepare your report, to refresh your memory of what was connected where, or which settings were used.

Data

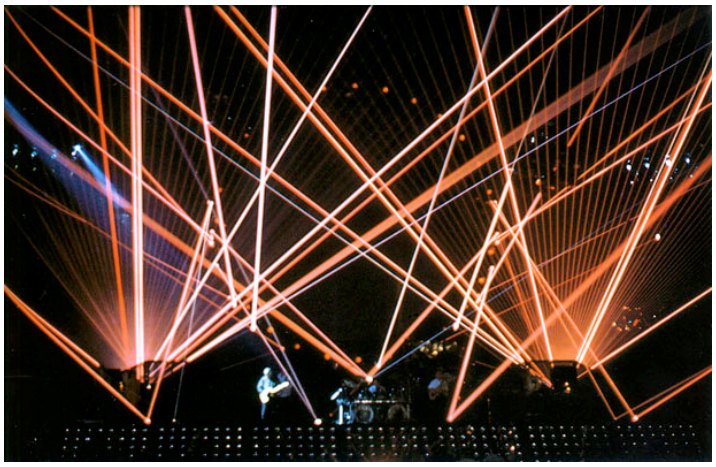
You must include all of your raw data. Data that seem anomalous or incorrect must still be included. If you think you have recorded data in error, you should be making notes as you proceed with the experiment to help you remember later. If you have, for example, transposed digits or otherwise written down incorrectly what was measured correctly, then you do not have to include this as part of your data. However, if you have erroneous data because you have incorrectly executed some procedure, or have an instrument on an incorrect setting, make sure to include these measurements. You should explain these data in the following section.

Organize your data in a logical and reasonable fashion. Make sure to include the units and uncertainties associated with each measurement.

Analysis

You must support all of your data reduction procedures. It should be clear both physically and mathematically why any particular manipulation of values is occurring. You should include all supporting material: diagrams, equations, graphs, as necessary.

In the event that you find that you have data that are clearly incorrect, you must justify this before you can proceed with any analysis that disregards the suspect data. For example, if you made and recorded several trials before you realized that the Black Box should have been set to Scale A instead of Scale B, then this data must still be included as part of your raw data. However, you should note the correction in the Analysis, citing this as justification for disregarding that data as you proceed with your reduction and analysis.



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If you need to include equations in your report, you will have to figure out a way to accomplish this. MS Word includes an Equation Editor, which is located Under the **Insert→Object…** menu. This will allow you to place an equation directly into your document. If you are a Tex user, carry on. You don't need my help or advice.

You should also perform careful error analysis on your results. Propagate quantifiable errors using the correct statistical methods. You should be able to demonstrate that measuring uncertainties are sufficient to explain any deviations in your results compared to accepted values.

If these propagated errors are insufficient, then you must be able to determine what additional errors may be present, and how they would affect the data or the reduction. You should be able to distinguish between random and systematic errors, and be able to explain how any particular error might be minimized or eliminated from future experimental trials.

Conclusions

Summarize your report here. Address whether you have achieved the specific goals of the experiment, and if not why not. You should not, however, completely reiterate the same arguments from your analysis. If your results are spectacular, then this should be a relatively brief paragraph. However, if your results are *not* particularly impressive, then you should carefully consider what adjustments of technique (or equipment) should be considered in the next trial of the same experiment.

References

You should include a comprehensive bibliography of sources. It will not be possible for you to adequately report on your experiment without referring to some external sources.

The bibliography may include your textbook or other reference volumes, journal articles, or online resources. Use a standard bibliographic format. Your textbook contains an extensive bibliography of references.

Exercise your judgment when evaluating the reliability of your sources. While looking stuff up on the internet is usually faster than tracking down an actual book in the library, you must be aware that just because it's on the web does not make it true. You should not rely exclusively on internet sources.

Journal articles can be dense and difficult to read, even if they are at the level of your understanding. You should always try the peer-reviewed journals first (if you really plan to be a physicist, then you should not really mind this, even if it is hard). However, you may find equally reliable information in a more entertaining presentation by consulting *Scientific American* (or other popular general science magazines). The author of that journal article may have modified it for a less technical audience and sent it to *SciAm*.

The same technique also works in reverse: track down the publications of the author of the *SciAm* article, and find the more technical journal article if you need it.

Consult your favorite style manual for bibliography format, or you can use the simplified version on the left. You should list your sources alphabetically by author.