

Proposal Workshop

1 Overview

This proposal is your team's roadmap for the final research project. It will outline your research question, analysis plan, and time management strategy. A well-thought-out proposal puts your team in a good position to carry out your analysis and complete the research memo and summary slide.

Proposal writing is a valuable skill in both academic and industry settings, where it is used to secure funding, collaborators, and contracts. An important part of this process is iteration. Proposals go through multiple internal drafts and revisions before their final submission. Your proposal will be reviewed 'internally' twice, first by your TA and then by the instructor, giving you the opportunity to refine your ideas. Your goal is to present a clear, focused plan so that each round of feedback can be specific and useful.

1.1 Writing Expectations

The proposal writing process is practice for scientific writing, where clarity and precision matter as much as the analysis itself. Your proposal should be written in full sentences and organized paragraphs. Avoid bullet-only responses or fragments (except where explicitly requested, such as in the timeline section).

Clear writing helps your TA and instructor provide specific, actionable feedback. If your ideas are not fully explained, feedback will necessarily remain general.

As you write:

- Explain your reasoning, not just your choices.
- Define terms clearly (especially measurement parameters and metrics).
- Be specific about what you mean by words like compare, analyze, or trend.
- Avoid vague phrases such as "see what happens" or "explore the data." Instead, be concrete about what you will calculate, estimate, or test.

Note

During the proposal review process, reviewers (in this scenario your TA and instructor) cannot see your thought process. They can only read what is on the page. Use this space to clearly explain your ideas and plans.

2 Define Your Research Question

Purpose: Identifying the specific question your team will answer.

What is expected: A focused, one-sentence question that can be answered with the dataset available in class.

Your instructor will provide the specific independent variables and cell assignments for this semester on the Canvas week page.

There are many possible dependent variables to consider. Using data collected from J-V and EQE apparatus, the following measurement parameters can be considered to evaluate the impact of the stressing.

- J-V measurements:

- PCE, J_{sc} , V_{oc} , fill factor, V_{mpp} , J_{mpp} , reverse/forward scans
- EQE values from ~350 nm–750 nm:
 - EQE at a specific wavelength or averaged over a wavelength band (e.g., ~500–570 nm), long-wavelength edge, shape of curve

Decide how you will use the six weeks of measurements. Examples include:

- End-point values: What is the final value of the measurement parameter after stressing is complete?
- Change over time: How does the first stressed value of the measurement parameter compare to the baseline value?
- Rate of change: What does the week to week change in the measurements look like?

A good starting place is to choose one independent variable, one measurement parameter, and how you want to use the temporal data. Note, you do not have to stick to just one measurement parameter.

2.1 Advice for Thinking About Your Research Question

- Identify a single trend, relationship, or comparison you are curious about.
- Ensure that your question can be answered with one or two key figures.
- If your question feels too broad, reduce it to one position comparison (e.g., center vs edge), a narrow run range, or a single EQE band/wavelength.

3 Plan Your Analysis and Figures

Purpose: Describing how you will use the data to answer your question.

What is expected: The specific data you plan to use (variables, conditions, subsets) and the analysis methods you will apply.

Data: List the exact variables, conditions, or subsets of data you will use. Examples include:

- Cells used in analysis: which platen positions (e.g., subset of locations or all of them) or cycle-number(s) (0, 5, 10)
- Measurement parameter(s): e.g., PCE / J_{sc} / V_{oc} / FF or EQE-derived metric (define exactly: single wavelength, band average, or integrated area)
- Temporal data range: what weeks of measurements will you use

Analysis methods: Describe how you will analyze the data. Examples include:

- Estimating uncertainties or confidence intervals
- Distribution fitting
- Fitting models or trendlines
- Statistical tests to compare measurements

Figures: Sketch or describe the main figure(s) you expect to make.

- Consider what the x-axis, y-axis, and any groupings may look like.
- Consider if you also will include a table or additional plots.

3.1 Advice for Thinking About Your Analysis Plan

- If you state that you will “compare” two or more things, explain what you mean by compare. (Should not just be looking at a plot of raw data.)
- Ensure your analysis can be done with the tools you already know (e.g., analysis methods used in previous Colab notebooks) or tools you want to learn.
- Confirm that your figure directly helps answer your research question.
- Specify which variables will go on the axes of your main plot.
- Determine whether you need a secondary figure or table to support your findings.
- Decide how you will check or represent uncertainty in your results.

4 Create a Three-Week Timeline

Objective: Break down your project into weekly tasks.

What is expected: A list of tasks and who will do them each week.

Schedule: Determine who will do what each week. Here are examples of some of the items that could be included in your timeline, but don't be constrained by this list.

- Extract/clean the subset you need (positions/cycles/weeks).
- Make exploratory plots and check axes/units.
- Draft a sketch of the main figure for the summary slide.
- Run the planned statistical test.
- Create the main figure (labels, units, readable fonts, caption).
- Start writing memo Overview and Data/Analysis sections.
- Polish Results (final figure + a small supporting table if needed).
- Write Discussion (limitations + one “if we had more time/data” idea).
- Finish Conclusion + one-slide summary.
- Quick team run-through: Each member can explain the main figure in 60 seconds.

Roles: Decide who will be responsible for what parts of the final project each week. Some examples of roles are listed below, but tailor the roles to how your team works best.

- Data lead
- Stats/figures lead
- Memo lead
- Slide lead

In addition to the roles, come up with a plan of how you will get feedback from all team members on each part of the project.

Tip

Consider a backup plan. This is real research and things can go wrong. If time runs short, think about how you will adjust your analysis plan. For example, reduce your sample size, combine figures, or cut an analysis method.

Note. The timeline section can be presented as a bullet point list.

5 Finalize and Submit

Create your first-draft proposal in your team Google Drive folder using the three sections above (Question → Analysis & Figures → Timeline).

Version control matters just as much as how you organize data. Name your file clearly so it's obvious this is the first draft. Something like `PHYS2150_Proposal_TeamName_v1` works well. When you revise after TA/instructor feedback, make a new copy and increment the version.

To help version control even more, at the top of your document, include:

- Team name & member names
- Version (e.g., v1 — draft for TA review)
- Date

Before exporting your document as a PDF to upload to Canvas, do a final check of your proposal by considering the following questions:

- Confirm that your research question is focused and doable in three weeks.
- Clearly state your independent variable, your measurement parameters, and what weeks of data you will use.
- Identify your one (or two) main figure(s) that will appear on the slide, including what goes on each axis.
- Ensure your analysis steps are clear and realistic.
- Prepare a week-by-week plan with roles assigned.

Note

The entire instructional team and NLR scientists are eager to see the questions you pose and what your analysis reveals!