PRL+SM and arXiv submission guide

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1 Scope of this document

Edit 2023-10-22. Since discovering the bibliographic issue that arises during copy-editing and how tricky this can be to fix (Section 6), I no longer recommend following the advice of this document. Instead, after writing the main and supplementary content in the same document (which can be used for the arXiv version directly, as below), generate the Letter by removing the supplementary content, and the supplement by removing the main content except the bibliography command, which should be repositioned to occur after the supplementary content. This produces a supplementary material that has its own reference list, and an arXiv version whose citation numbers will not match that of the final Letter—but trying to match those two documents is a fool's game given the editing of text, floats and bibliographic entries that occurs during copy-editing. See `how_to_publish.pdf` for a step-by-step summary.

Nonetheless, the original problem was an interesting one to solve, and I am keeping this document for the records. Proceed reading with a severe risk of wasting your own time.

1.1 Problem addressed

You are intending to submit a manuscript (Letter) to the APS journal *Physical Review Letters* (PRL) with additional Supplementary Material (SM). At the same time, you wish to make your work

publicly available on https://arxiv.org (arXiv). Both PRL and arXiv generate a .pdf from raw files you submit: a main TEX document main.tex and a compiled bibliography (main.bbl). The difference is that for PRL main.tex must contains the content of the Letter (manuscript) only—SM is submitted as a separate .pdf which you must generate locally—whereas for arXiv it should contain both the Letter and SM.

This document provides an efficient workflow to produce the files for a PRL-arXiv submission. A critical problem solved is how to generate a SM .pdf for PRL with references to both items in the Letter and the SM itself, and with *active hyperlinks in the case the item is in the SM,* while at the same time preserving the correct bibliography structure (PRL requires the Letter's reference list includes articles cited in both the Letter and the SM). While I only refer to PRL specifically, submission to other APS journals is likely to be very similar, and may not have the complication of having separate SM (e.g. included as Appendices).

You shouldn't refer to this document if... You want a simple solution and aren't bothered by not having working hyperlinks for SM items in your SM .pdf. In that case, the easiest thing to do is to compile the entire document (resetting the page numbering for the SM perhaps) and simply extract the SM pages to a separate .pdf. To create the Letter .tex, simply remove all the SM text (you may need to make dummy cites to ensure the Letter bibliography contains all references).

1.2 What I would like to add to this document (todos)

- Guide to using the APS submission widget including section, header choices
- Guide to using the arXiv submission widget, plus considerations of submission timing, authorship
- updating an arXiv submission

2 Writing the manuscript

The basic structure we will be working from is a single main.tex containing the Letter (manuscript) and SM separated by a page break. See prl_template.tex for a basic template that may be used to create a revtex-4.2 (the APS/AIP article class) document in this format—it shouldn't be difficult to adjust or merge your own files if you've already written up in a different way.

Whilst writing the manuscript you will want to bear in mind the Physical Review style guide and word count limits. There is also an author's guide for the revtex class.

3 Preparation

Suppose we are in a directory containing our paper files:

```
paper_files/
    - main.tex
    - refs.bib
    - fig1.pdf
    - fig2.pdf
    - figSM1.pdf
    - figSM2.pdf
```

where `main.tex` is the manuscript plus SM, `refs.bib` the bibliography used by the main file (`bibliographyrefs.bib`) and `fig1.pdf`, `fig2.pdf` (`figSM1.pdf`, `figSM2.pdf`) figures used in the manuscript (SM). Note when submitting to PRL and arXiv all files must reside in the same (top-level) directory, so you can't e.g. use a `figures/` subdirectory containing all four figures.

Since we will submit the `.tex` directly, it is a good idea to clean up `main.tex` by removing any comments or unused code (this file will be publicly accessible via 'Download Source' on arXiv). Once you think your manuscript content is ready to make a submission (or re-submission), compile `main.tex` as you normally would i.e. running both a LaTeX compiler and BIBTeX program. *Check the output* `main.pdf` in case anything broke whilst you were removing commens etc. (we will be checking the output a lot).

From the files produced we will need `main.aux` and `main.bbl`, in addition to `main.tex` and any figure/data files required by `main.tex` (all other files can be left as they are). We will also need the scripts `parse_main_aux.py` and `select_links.py` to generate the SM. Create two new subdirectories `paper` and `supp` with

```
paper_files/paper/
    - main.tex
    - main.bbl
    - fig1.pdf, fig2.pdf # ANY figures/data used in main text (Letter)
paper_files/supp/
    - main.tex
    - main.aux
- figSM1.pdf, figSM2.pdf # ANY figures/data used in SM
- parse_main_aux.py, select_links.py # helper scripts
```

4 Generating manuscript (paper) files for PRL

Move into `paper_files/paper` (`cd paper`) and edit `main.tex`:

- Remove *all* SM text (content *between* `\bibliography{refs.bib}` and `\end{document}`)
- Replace `\bibliography{refs.bib}` with `\input{main.bbl}`
- Remove any `\typeout` arXiv command

The document should now be compiled *twice* using LaTeX only i.e. not BIBTeX. Since most editors will try to run BIBTeX automatically, I recommend doing this from the command line:

```
$ pdflatex main.tex && pdflatex main.tex
```

Two compilations are needed to get hyperlinks working. *Check the output* `main.pdf`. This should have the Letter with all hyperlinks (refs/cites) present and functional.

`main.tex`, `main.bbl` and any Letter figures/data are now ready to be uploaded to the APS submission server (todo: details on submission server UI). The following command creates a tarball `upload.tar` that can be uploaded directly:

```
$ tar -cvf upload.tar main.tex main.bbl fig1.pdf fig2.pdf
```

Do *not* include `main.pdf` or other auxiliary files produced when you ran `pdflatex`.

5 Generating SM (supp) for PRL

Move into `paper_files/supp` and edit `main.tex`:

- Remove *all* Letter text (content *after* `\begin{document}` up to and including `\bibliography{refs.bib}\clearpage`)

Now run `parse_main_aux.py main.aux` to produce `out.aux`. This removes any link that isn't a `\citation`, `\newlabel` or `\bibcite` commands (it also removes all commands corresponding to SM labels/citations). This is done to preserve references in the final SM `.pdf`. This list of commands is almost certainly incomplete, so you may find we need to add others (let me know). Once we think this ran successfully (or would like to test it), rename `out.tex` to `labels.aux`.

Next run `select_links.py main.tex` to produce `out.tex`. This script finds commands e.g. `\cite{kubo1962}`, `\eqref{eq:1}` that reference labels from the Letter, and wraps these references with a command `\nolink` (defined below) which suppresses the creation of a clickable link for these elements. The point is in the final SM we want to be click references to items (equations, figures etc.) in the SM itself, but not items in the Letter. This is done using regular expressions (Python `re`), and will almost certainly not work perfectly the first time you use it given the variety of commands available to references in a LaTeX document: `\cite{}`, `\Cite{}`, `\ref{}`, `\eqref{}`, `\cref{}`, `\Cref{}`, should certainly all work, but get in touch with me to fix the script for your use case. Once things look to be working (or we want to test whether they are), rename `out.tex` to `supp.tex`.

Finally, edit `supp.tex` and immediately *above* `\begin{document}` add

```
\input{labels.aux} % file generated by parse_main_aux.py
\newcommand*{\nolink}[1]{%
  {\protect\NoHyper#1\protect\endNoHyper}%
}
```

Do a double LaTeX compilation of `supp.tex`:

```
$  pdflatex supp.tex && pdflatex supp.tex
```

If everything worked, `supp.pdf` should contain SM with all references present, but only those referencing items in the SM itself featuring an active link (you may chose to disable the link colour by passing `[colorlinks=false]` or `[hidelinks]` options to the `hyperref` package in the preamble. `supp.pdf` can now be uploaded as it's own document using the APS submission widget (alongside the files uploaded in the previous section).

6 Fixing bibliography numbers—Important, read first

So you submitted a manuscript plus a supplementary `.pdf` with working hyperlinks as well as citations that correspond to the reference list of the main document. The manuscript is accepted and goes to proofing. You're feeling pretty good. But what's this, it comes back from the copy-editor and half of the main citation numbers have changed? Now the citation numbering in your supplementary `.pdf` is all wrong! Worse, you only noticed this after publication![1]

The problem is that PRL considers *references in the supplement to be made at the point at which you first cite that supplement in the text.* The exceptions are articles that are already cited in the

[1] True story—PhysRevLett.129.173001 was published on 21 October 2022. It's the 22nd of October 2023 and I am currently trying to get this corrected via `prl@aps.org`.

Letter: they appear in the biography in the order they are cited in the Letter text, even if if this is after the first reference to the supplement. An illustration is helpful. Suppose you cite bib-entries A, B, C, D, E in the main text where C is the Supplementary Material, and in that supplement you cite A, D, F, and G. Then the PRL copy-editor will produce a reference list

1. A
2. B
3. C
4. F
5. G
6. D
7. E

whereas you thought the order was of course A-G consecutively. Consequently, ctiations D, F and G in the supplement text will now have incorrect numbers according to the new (copy-edited) reference list of the Letter.

There is a solution to correct the numbers, but it can be tricky and require a lot of manual checks, especially if you also have floats with citations or footnotes (see below). Ultimately, trying to match the look of the final published document in the arXiv version is a silly pursuit, so why not just accept they will be different and compile a separate supplement for PRL with its own bibliography (see `how_to_publish.pdf`). You have been warned.

First, make a list of all the works you cite in the supplement (A, D, F, G above). Remove any which are also cited in the main Letter (F, G remain). Immediately after the first reference to the supplement in `main.tex`, add a `\nocite` command with these references. For example,

```
See Supplementary Material~\cite{C}.\nocite{F,G} ...
```

This command adds entries to the final bibliography without creating an actual citation in the text i.e., inserts phantom citations.

Second, if you have floats containing references, you will need to make sure these occur in the same position relative the first supplement citation as they do in the copy-edited version from PRL (otherwise this may also disrupt the numbering).

Third, if you have a footnote—displayed like a citation—in the supplement, you will need to make this a `@misc` entry in your `.bib` file, add it *in the correct position in the nocite command*, and finally `cite` it in the supplement (instead of using the `\footnote` command). For example, if in the supplement you have

```
\cite{F}. Main text\footnote{A footnote - which may contain citations!} \cite{G}
```

You would add to `refs.bib`

```
@misc{fn1,
note = {A footnote - which may contain citations!},
}
```

and then in the Letter

```
See Supplementary Material~\cite{C}.\nocite{F,fn1,G} ...
```

and the above line in the supplement should be changed to

```
\cite{F}. Some text\cite{fn1} \cite{G}
```

Clearly it is less than ideal to have the footnote text in a separate document to the supplement, adding more weight to the argument of producing a separate supplement for PRL with it's own reference list.

Finally, you will need to manually check all the numbers, since there are clearly many things that can go wrong (what happens if footnote `fn1` contains (new) citations?).

7 arXiv submission

This process is far simpler as our main file has the format we want for arXiv already. Create a directory `paper_files/arxiv` and copy `main.tex`, `main.bbl` and *all* (Letter plus SM) figures/data files there. Now simply create a single tarball which can be directly uploaded to arXiv:

```
$ cd arxiv
$ tar -cvf upload.tar *
```

A more detailed guide is available at https://trevorcampbell.me/html/arxiv.html.