Streak Camera Diagnostics and Tune Resonance Tools at HZB

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I. INTRODUCTION

The Helmholtz-Zentrum Berlin is a facility that operates two synchrotron light sources: BESSY II and the MLS. One of the long term goals at these facilities is to continually make bunch lengths as short as possible in the storage rings. A way to go about this is through lattice design, and an important part of lattice design involves picking a good working point to avoid the tune resonances of the machine. A tune resonance program was therefore developed which can be used to view the current working point of any machine given a few parameters.

Another way of looking into bunch lengths at HZB is through diagnostic tools. A new streak camera was recently purchased for BESSY II, but is currently being setup and tested at the MLS where the old streak camera also resides. The Metrology Light Source (MLS) is an electron storage ring designed as a dedicated UV and VUV source; it has an asymmetric double-bend achromate design as well as six beamlines, two of which are located on a second floor, above the synchrotron. The new streak camera, as well as the old one, is setup with a beamline on the second floor. AAThe setup proved to be quite a challenged because of the placement of the camera and beamline. An optical setup that needed to provide three degrees of freedom was setup; this setup also provided the opportunity to operate both streak cameras (old and new) at the same time and compare measurements.

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A. Prerequisite Documentation

The following documentation should be considered your first source of information on how to prepare your document for use with this format; they are to be found within the APS REVTeX 4.1 distribution. Updated versions of these are maintained at the REVTeX 4.1 homepage located at http://authors.aps.org/revtex4/, are also available at the Comprehensive TeX Archive Network (CTAN, see http://www.ctan.org/), and form part of the TeXLive distribution of TeX.

- *Author's Guide to REVTeX 4.1*
- *REVTeX 4.1 Command and Options Summary*
- *What's New in REVTeX 4.1*

The present guide builds upon these documents, with which you should already be familiar.

The AIP substyles distribution for REVTeX 4.1 includes a sample document (`aipsamp.tex`), a good starting point for the manuscript you are preparing for submission to an AIP journal.

By using REVTeX's *Author's Guide to REVTeX 4.1*, you can develop your document until it contains all of the content you desire. This guide informs you on document class options, commands, and markup guidelines specific to AIP journals.

B. Software Requirements

This guide assumes a working REVTeX 4.1 installation including the AIP substyles. Please see the installation guide included with the distribution.[1]

Please note that the AIP substyles work *only* with REVTeX 4.1: the original REVTeX 4.0 release does *not* make the AIP substyle available, nor is it compatible with them.

For your computer to run REVTeX 4.1 with the AIP substyles, the following are required:

- a working installation of LaTeX
- REVTeX 4.1 and all packages it requires,
- the AIP substyles for REVTeX 4.1, and
- any further LaTeX packages used in your document.

The easiest way to obtain all of the needed software is to install an up-to-date distribution of TeX, like TeXLive, available on CTAN.

To obtain the most up-to-date version of this software, please see http://www.aip.org/pubservs/compuscript.html.

C. Submitting to AIP Journals

Authors preparing a manuscript for submission to AIP journals should consult the Information for Contributors for the applicable journal, available through links at http://journals.aip.org/. These requirements are not covered systematically in this author's guide; you are responsible for understanding the requirements of the particular journal to which you will submit your article.

For further information about journal requirements, contact the Editorial Office of the appropriate journal. (Follow links at http://journals.aip.org/.)

D. Contact Information

Any bugs, problems, or inconsistencies concerning the AIP journal substyles should be reported to AIP support at tex@aip.org. Reports should include information on the error and a *small* sample document that manifests the problem, if possible. (Please don't send large files!)

Feedback concerning REVTeX 4.1 itself should be sent, as usual, to the American Physical Society at revtex@aps.org.

To determine if the problem you are experiencing belongs to REVTeX or is specific to the AIP substyles, simply remove `aip` from your document class options and rerun your document. If the problem goes away, you may assume that it is due to the AIP substyles; if not, it belongs to REVTeX.

II. SAMPLE LaTeX 2ε DOCUMENT

As the REVTeX documentation makes clear, your document employs a LaTeX 2ε document class (specifically `revtex4-1.cls`), so you should use the LaTeX 2ε commands and environments familiar to you with, say, the standard article class `revtex4-1.cls`, and you will be able to employ many of the packages you are used to using with LaTeX 2ε.

TABLE I. AIP journal substyles

Journal	class option
Appl. Phys. Lett.	`apl`
Biomicrofluidics	`bmf`
Chaos	`cha`
J. Appl. Phys.	`jap`
J. Chem. Phys.	`jcp`[a]
J. Math. Phys.	`jmp`
J. Renewable Sustainable Energy	`rse`
Phys. Fluids	`pof`
Phys. Plasmas	`pop`
Rev. Sci. Instrum.	`rsi`

[a] Default journal substyle.

Using `aipsamp.tex` as an example, your document will start with the usual REVTeX `\documentclass` statement, but with a particular document class option `aip` that specifies the AIP substyle:

```
\documentclass[aip]{revtex4-1}
```

You will then invoke the LaTeX 2ε compatible packages your document requires, say:

```
\usepackage{graphicx}%
\usepackage{dcolumn}%
\usepackage{bm}%
```

follow up with your document content:

```
\begin{document}
...
```

and finish with a statement specifying your BibTeX database:

```
\bibliography{aipsamp}
\end{document}
```

The books in the bibliography of this guide provide extensive coverage of all topics pertaining to preparing documents under LaTeX 2ε they are highly recommended.

III. REVTeX CLASS OPTIONS SPECIFIC TO AIP

A. Journal Substyle

To access particular features of the AIP substyle, you will specify an additional document class option: the journal substyle, e.g.,

```
\documentclass[aip,jcp]{revtex4-1}
```

in this case, *J. Chem. Phys.*, the default. A complete list of AIP journals with the corresponding journal substyle appears in Table I.

B. Options for Citations and Bibliography

The citation style for AIP journals is:

- numerical (default style),
- author-year, and
- numerical author-year,

the latter two styles being only allowed for *Chaos* or *J. Math. Phys.*

The familiar numerical citations and numbered bibliography are the default for most journals: citations are superscript numbers, and the (numbered) bibliographic entries appear in the order cited.

Author-year citations are only allowed for *Chaos* or *J. Math. Phys.*, with citations given in author-and-year format. Bibliographic entries are sorted by alphabetical order of first author's surname, then by year.

Numerical author-year citations (only allowed for *Chaos* or *J. Math. Phys.*) are superscript numbers, just like numerical citations, but the bibliographic entries are sorted like the author-year entries and are numbered. This means that the first citation will not necessarily be 1.

To obtain the numerical style, simply accept the default, or supply a class option of `numerical`:

```
\documentclass[aip,numerical]{revtex4-1}
```

For author-year citations for *Chaos* or *J. Math. Phys.*, you may specify the `author-year` option:

```
\documentclass[aip,author-year]{revtex4-1}
```

Each of the above two options are part of standard REVTEX.

To obtain numerical author-year citations for *Chaos* or *J. Math. Phys.*, give the author-numerical option:

```
\documentclass[aip,author-numerical]{revtex4-1}
```

Note that the `author-numerical` option is not part of standard REVTEX so use of it outside of the AIP substyles may not have any effect.

C. Formatting Options

There are two commonly used formats for an article you may write. One will comply with the manuscript submission formatting requirements of the editorial office of the journal you are submitting to. The other will emulate the format of your article in the published journal itself.

For journal submission, accept the default, or you may specify the `preprint` option:

```
\documentclass[aip,preprint]{revtex4-1}
```

To emulate the formatting of the journal, specify the `reprint` option:

TABLE II. Other class options

Function	**class option**
Citation and References	
superscript numbered	`numerical`[a,b]
author-year	`author-year`[c]
numbered author-year	`author-numerical`[c]
Format	
journal submission	`preprint`[a]
journal emulation	`reprint`

[a] Default option.
[b] Standard
[c] Only allowed for *Chaos* or *J. Math. Phys.*

```
\documentclass[aip,reprint]{revtex4-1}
```

Note that emulation is not by any means complete: the fonts used will differ, and therefore the length of the article will not represent an accurate estimate. Other details may also differ.

A summary of class options of interest to AIP authors appears in Table II.

IV. USEFUL LaTeX 2ε MARKUP

LaTeX 2ε markup is the preferred way to structure your file. In general, the use of low-level commands like TEX primitives or Plain TEX macros is less preferable. Please see the REVTEX User's Guide,[2] the LaTeX manual,[3] and the LaTeX 2ε book[4] for further details.

A. Title and Front Matter

The REVTEX User's Guide has complete information on using REVTEX's special markup for your article's title, author list, abstract, and other front matter elements. Note that class option `superscriptaddress` is the default for the AIP substyles, as required by all AIP journals.

B. Lead Paragraph

One AIP journal, *Chaos*, requires a paragraph of text to precede the first `\section` of the article; this is known as a lead paragraph and is formatted boldface. To give your article a lead paragraph, include a quotation environment ahead of the first `\section` command:

```
\documentclass[aip]{revtex4-1}
\begin{document}
 \begin{quotation}
  Here is my lead paragraph!
 \end{quotation}
 \section{Introduction}
```

...

The `quotation` environment functions normally after the first `\section` command in the document.

V. BODY

For general information on commands used in the body of the document, see the REVTEX User's Guide. Herein are some features specific to the AIP author.

A. Footnotes

If you are using numbered citations (numerical or numbered author-year), footnotes are by default incorporated into the reference section along with your bibliographic entries. This automated feature is only effective if you use BibTEX to prepare your bibliography.

Author-year style bibliography does not lend itself to such a treatment, so by default footnotes appear in text as is usual. However, be advised that, if your article is accepted for publication, footnotes may be incorporated into text during the production process.

VI. CITATIONS AND REFERENCES

The preparation of your bibliography "by hand" is possible; however, if you do so, you will be entirely responsible for compliance with submission requirements for your bibliographic entries, for incorporating any text footnotes into the references, and for checking bibliographic entries. (In this connection, you may find useful the file `reftest.tex`, distributed with REVTEX.)

There are numerous reasons to use BibTEX, not least because it automates the first and second of the above checks.

A. Using BibTEX

Refer to the REVTEX User's Guide, the LATEX manual, and the BibTEX manual for full information about using BibTEX.

When using BibTEX keep in mind that changing your bibliography style or citation style (via the document class options described above) will require you to rerun BibTEX. The standard litany (using `aipsamp.tex` as an example) for this is:

```
> latex aipsamp
> bibtex aipsamp
> latex aipsamp
> latex aipsamp
```

Here, the first invocation of `latex` has the effect of rewriting the `aipsamp.aux` file, and the invocation of `bibtex` creates a new `aipsamp.bbl` file. The next two runs of `latex` are then required: the first to update the `aipsamp.aux` file reflecting the new values of your citations and the second to employ those citations correctly. Be sure to check the end of the `aipsamp.log` file for any message advising you to rerun `latex`.

B. Multiple References per Citation

In an article using numerical citations, it is not uncommon to encounter the need for a citation that refers to more than one article or other reference. To accommodate such a case, REVTEX 4.1 implements markup similar to that of the `mcite` package for LATEX 2_ε.

Let's say that two citation keys `able` and `baker` need to be combined into a single reference. The syntax for the `\cite` command is:

```
word\cite{able,*baker} further text
```

When you run BibTEX the resulting bibliography will contain the two entries, but run together as a single numbered reference. In the `\cite` command argument, any cite key that starts with the * character signifies that its bibliographic entry is to be joined together with the one preceding it; the `*` may join together any number of entries into a single reference.

[1]For help regarding the installation of this software and its use, please send email to tex@aip.org.

[2]Available with the REVTEX distribution, see `http://authors.aps.org/revtex4/`.

[3]L. Lamport, *LATEX a Document Preparation System* (Addison-Wesley, Reading, MA, 1996).

[4]M. Goosens, F. Mittelbach, and A. Samarin, *The LATEX Companion* (Addison-Wesley, Reading, MA, 1994).

[5]D. E. Knuth, *The TEXbook* (Addison-Wesley, Reading, MA, 1986).

[6]H. Kopka and P. Daly, *A Guide to LATEX 2ε* (Addison-Wesley, Reading, MA, 1995).

[7]M. Goossens, S. Rahtz, and F. Mittelbach, *The LATEX Graphics Companion* (Addison-Wesley, Reading, MA, 1997).

[8]S. Rahtz, M. Goossens *et al.*, *The LATEX Web Companion* (Addison-Wesley, Reading, MA, 1999).