# REVTEX Information for OSA Authors

Instructions to authors for preparing compuscripts to be submitted to OSA journals in the REVTEX 3.0 format. Release date: November 10, 1992.



**Contents**

## I . ELECTRONIC MANUSCRIPT FILE SUBMISSION

Quick-Reference Check List for Submission:

| Submission by IBM-compatible formatted diskette should include: | |
|---|---|
| 1. | Cover letter with journal and manuscript identification, hardware identification, and corresponding author information restated |
| 2. | Diskette with filename(s), manuscript number, and first author's name written on label |
| 3. | REVTEX 3.0 file(s) on the diskette that match the final, accepted manuscript |
| 4. | Paper copy of the final, accepted manuscript, with camera ready figures. |

The Optical Society of America is pleased to invite electronic files in REVTEX 3.0 from authors of journal manuscripts. At this time, the REVTEX format can be converted by OSA's commercial typesetters, and it is hoped that most files submitted in this fashion will be usable.

Electronic manuscript files should be submitted at the conclusion of the peer review process. The key is that, on acceptance, the author's electronic file must be in the hands of the OSA Manuscript Office staff. The electronic version must be that of the authors's final, accepted manuscript. If it is not, the file will simply not be used.

A cover letter containing the following information should accompany any electronic file submission:

1. Article identification – include journal name, manuscript number, title of paper, and the fact that this is a REVTEX 3.0 electronic file submission
2. Computer information – give the name of computer used and the density of the diskette
3. Corresponding author information – telephone and facsimile numbers, plus an e-mail address if available, should be restated in the cover letter

Failure to include the necessary information may preclude the use of an author's file. Also, if questions arise and the author cannot be reached for an answer in a timely fashion, then the file may not be used (OSA will not delay publication of an author's work in this way).

The address for submission is given below for the following four OSA journals:

*Journal of the Optical Society of America A*
*Journal of the Optical Society of America B*

*Applied Optics.*
*Optics Letters*

Conventional mail delivery of the author's file on diskette to the address below is the current mode of receipt. In the future, electronic mail options are expected to be available as well.

Optical Society of America
Manuscript Office
2010 Massachusetts Ave., N.W.
Washington, D.C. 20036-1023

Telephones: (202) 416-1916 - Manuscript Office

(202) 416-1903 - Technical Assistance

Facsimile : (202) 416-6120

E-mail: (Internet) osamss@pinet.aip.org – Manuscript Office

fharris@pinet.aip.org – Technical Assistance

A paper copy of the manuscript is still required with submissions on diskette. Copy editing will still take place on paper, and then the marked paper plus electronic file will be sent to one of OSA's typesetters.

The typesetter will examine the author's file to determine whether it will be easier and less costly to convert and utilize the full file or just parts of the file or to rekey the manuscript completely. The author's compliance with the stylistic directions of LATEX and REVTEX along with the degree of copy editing will be the main factors affecting this decision. In all cases, the typesetter will identify the course of action taken by including a feedback form that the author will receive with the proof.

It may be interesting to know that the Society's typesetters do not use REVTEX or LATEX for their actual typesetting. They currently use Xyvision or Arbortext, which are professional, specialty systems used by the typesetting industry.

## II . WHERE TO TURN FOR HELP

Authors are expected to know the basics of TEX and LATEX before using REVTEX. Also, authors should fully review the README file included in REVTEX 3.0 before getting started. But if problems or questions specific to REVTEX 3.0 arise, the following staff person from the Optical Society will advise the OSA author:

Frank E. Harris
Optical Society of America
2010 Massachusetts Ave., N.W.
Washington, D.C. 20036-1023

Telephone: (202) 416-1903

Facsimile: (202) 416-6120

E-Mail: fharris@pinet.aip.org (Internet)–for REVTEX help only

fharris@aip.org – other inquiries.

To FTP for files: ftp aip.org

anonymous

(Your Internet address)

cd revtex30

mget *

Some inquiries may be forwarded to OSA members who have volunteered to assist in answering REVTEX technical questions. Through this member-assisted network, it is OSA's intent to provide satisfactory answers to all REVTEX-related questions that OSA authors ask.

If you are willing to participate in this member-assistance program for REVTEX, please get in touch with Frank E. Harris, at the above e-mail address.

If you are new to TEX and LATEX, some books that you might find useful are

- Paul W. Abrahams, TEX *for the Impatient,* (Addison-Wesley Publishing Company, Reading, Massachusetts, 1990)
- Leslie Lamport, *LATEX - A Document Preparation System,* ( Addison-Wesley Publishing Company, Reading, Massachusetts, 1986)

## III . GETTING STARTED: BASIC TEMPLATES AND OVERVIEW

This is a description of the components of REVTEX 3.0 that are specific to OSA's journals. A brief map of what files are relevant and an overview of use are provided. The quick-reference guide below is intended for advanced users of REVTEX 3.0, while more detailed how-to-use information is given in Section **IV**.

**NOTE: All users of REVTEX 3.0 should fully review the README file before getting started. MS-DOS users can use the TYPE command. Type: TYPE README: MORE [carriage return].**

Users of REVTEX 3.0 for OSA journals will want to use the following files:

| | |
|---|---|
| README | - Brief instructions on REVTEX use |
| revtex.sty | - Main style file for all physics societies |
| osa.sty | - Society-specific style file for OSA journals |
| osa10.sty | - Fonts and format style file for OSA journals |

| | |
|---|---|
| osa12.sty | - Fonts and format style file for OSA manuscripts |
| osabib.sty | - Society file for bibliography style |
| template.tex | - OSA template for creating a manuscript |
| manosa.tex | - The OSA portion of the REVTEX manual, part of which shows output and corresponding REVTEX input on facing pages |
| sample.tex | - Short excerpts of the three manuscripts listed below, (about 20% of each original paper), with corresponding input |
| josaa.tex | - Sample JOSA A paper (excerpts) |
| josab.tex | - Sample JOSA B paper (excerpts) |
| aplop.tex | - Sample Applied Optics paper (excerpts) |

OSA authors will want to "LATEX" and print sample.tex, and also the more complete sample for the journal to which they are submitting, josaa.tex, josab.tex, or aplop.tex. Optics Letters authors should refer to josaa.tex or josab.tex for a style guide, and select the josaa option in the documentstyle command for their manuscripts.

A valuable tool for authors new to REVTEX is the raw input files josaa.tex, josab.tex, and aplop.tex. These may be imported into a word processor and printed, so that input and REVTEX output can be compared.

The OSA template (template.tex) is a document file set up and ready to use for manuscript input. It includes all the basic section tags and formatting commands (macros) that are relevant to an OSA manuscript. For a list of all available macros, please refer to Appendix B, and for a list of symbols, see Appendix A. It may also be helpful to scan the manuscript example provided in Section **V** to find other macros that may be useful to a particular application.

The three style files (osa.sty, osa10.sty, and osa12.sty) will interpret the macros in terms of special layouts and fonts for OSA journals and thus will produce a properly formatted manuscript when printed. The file osabib.sty handles cross-referencing and bibliographic citations and makes sure that these are formatted according to OSA style.

### A. Quick-Reference Guide

The following quick-reference guide may be particularly useful for advanced REVTEX users.

1. See Appendix A for a list of symbols.
2. See Appendix B for a list of all REVTEX macros in addition to many useful LATEX macros. [Do not create and use new macros. Use only LATEX and REVTEX macros so the file will be usable by OSA's typesetters.]

3. Sections, subsections and subsubsections are supported. It is also possible to suppress section numbering by putting a star after each command, i.e., `\section*`{your name}.

| | |
|---|---|
| Main section heading: | `\section` |
| First subheading: | `\subsection` |
| Second subheading: | `\subsubsection` |

4. Delimiter for in-line math: $

5. To display and automatically number an equation, start with `\begin{equation}` and finish with `\end{equation}`.

6. To display and automatically number a group of equations, use `\begin{eqnarray}` and `\end{eqnarray}`. To get each equation to line up under the = or $\leq$ or similar sign, surround the = sign in each equation with & signs.

7. To number displayed equations manually, use `\eqnum{thenumber}`. This option would be used for equation ($7'$), etc.

8. To number equations using letters start with `\begin{mathletters}` and end with `\end{mathletters}`.

9. Number by section: Put the `\eqsecnum` command before the first section.

10. Citations for cross referencing equations and sections use the same commands. Bibliographic citations have separate commands.

| | |
|---|---|
| Tag for citing equations in text: | `\ref{tag}` |
| Tag for equations to be cited: | `\label{tag}` |
| Tag for citing references in text: | `\cite{reftag}` |
| Tag for citing references "on the line" in text: | `\onlinecite{reftag}` |
| Tag for listing references: | `\bibitem{reftag}` |

11. Journal name shortcuts: See Table 5 in section **V**.

12. Place figure captions at the end of your manuscript. Use the commands `\begin{figure}` and `\end{figure}` to start and end each figure. Use the command `\caption{your caption here}` to create and automatically number the caption. To label figure captions use `\label{figureName}`. Numbering is automatic.

13. Please place your tables at the end of your manuscript submission. The typesetters will put them in the appropriate place within the journal.

| | |
|---|---|
| Start the table environment with | `\begin{tabular}`, |
| and end with | `\end{tabular}`. |

Within the table environment, some standard options are:

| | |
|---|---|
| Caption and number: | `\caption{caption here}` |
| Begin tables: | `\begin{table}{column data}` |
| End tables: | `\end{table}` |
| Make a horizontal rule: | `\tableline` |
| Column headings: | `\multicolumn{}{}` |
| Footnotes: | `\tablenote{note here}` |

## IV . DETAILED HOW-TO-USE INFORMATION

NOTE: Do not create and use new macros. Use only LATEX and REVTEX macros so the file will be usable to OSA's typesetters.

### A. Title, Authors, Affiliation, Abstract

The document template for OSA (template.tex) already contains the basic macros for the early parts of any manuscript: the title, author(s), affiliation(s), and abstract.

### B. Text

Paragraphs always begin with a blank input line. Unless a hyphen is required in a word and that hyphen falls at the end of a line as you type it, do not hyphenate a word at the end of a line; REVTEX will do this. Continue to hyphenate modifiers within a line of text, e.g., “electro-optical devices.”

Use 2 single curly quotes for quotation marks around quoted text (“xxx”), not straight quotes (”xxx”). For opening quotes this is two octal 140 characters (hex 60, near the top left on most keyboards); for closing quotes, this is two octal 047 (hex 27) characters.

Don't use `\smallskip`, `\bigskip`, or any other vertical motion commands. Horizontal motion commands are unnecessary as well.

Authors should avoid the use of specially designed ”define characters” and choose symbols from those shown in the LATEX User's Guide & Reference Manual or in Appendix A of this REVTEX Author's Guide. There is no guarantee that a specially designed definition will produce the desired results at the typesetter's production facility. If a special symbol is required and not listed in the LATEX User's Guide & Reference Manual or in Appendix A of this REVTEX Author's Guide, please request special consideration in the cover letter accompanying the file submittal. The copy editor will make note of it, and the typesetter will attempt to accommodate the author. *Use of unusual characters is subject to approval* *by the managing editor.*

### C. Section Headings

Three levels of headings are provided in REVTEX: section, subsection, and subsubsection. Precede the section heading with the * command to suppress the automatic numbering; e.g.,

```
\section*{Introduction}
```

To label a section heading for cross referencing use the `\label` command after the heading; e.g.,

```
\section{Introduction} \label{sec:intro}
```

### D. Math Within Paragraphs

REVTEX uses the delimiter $ for any in-line math, e.g., the quantity, $a^z$, is obtained from the input, `$a^z$`.

Another example of in-line math is

output:... difference between $\langle J_z \rangle (t)$ and $\langle J - z\rangle_{\rm HF}(t)$...

input: ... difference between $\`\langle` J_z `\rangle`

(t)$ and $\`\langle` J_z `\rangle`_{\rm HF}(t) ...$

Standard mathematical style conventions are followed for in-line math, such as smaller point size for superscripts/subscripts, appropriate use of roman, italic, greek, and script fonts, and the use of special math symbols. See Appendix A for a list of available symbols.

TEX will take care of setting the point size appropriate for variables and numbers in the superscript/subscript position.

TEX makes latin letters within math italic by default. These are commonly used for variables. To get the roman font, commonly used for functions such as exp and erf, use the `\rm` command.

input: `$... {\rm exp}(t^2 - t) ...$`

output: ...$\exp(t^2 - t)$...

TeX will assume that you want the superscript or subscript to consist of the first token (generally a single character or command) following the `^{hat} or _{en dash}` unless you use curly brackets to delimit the superscript/subscript. It is safest to use the curly brackets if unsure. The curly brackets here also serve to limit the scope of the `\rm` command. Again, don't use any vertical or horizontal motion commands in math.

### E. Displayed Equations

The most common (and preferred) type of displayed equation is a narrow, indented single-line equation, with an equation number on the same line. Try to set as many equations as you can in this way. Specifically, use a solidus instead of a built-up fraction whenever possible.

#### *1. Numbering displayed equations*

REVTeX 3.0 permits two methods for numbering equations. You can assign your own equation numbers or you can allow REVTeX to number for you. Equation numbers are not mandatory, and numbered and unnumbered equations may be intermixed.

Use the command `\eqnum{thenumber}` to number on your own. You can also use this command to produce a specific equation number not normally obtainable, (1′), for example.

For automatically numbered single-line and multiline equations, use the equation and eqnarray environments. You can use the `\[,\]` commands and the eqnarray* environment for unnumbered single-line and multiline equations, respectively. The command `\nonumber` will suppress the numbering on a single line of an eqnarray.

If you wish a series of equations to be a lettered sequence, e.g., (1a), (1b), and (1c), just include the equations or eqnarray within the mathletters environment.

Finally, to have REVTeX number equations by section, use the eqsecnum style option. See the sample manuscript in Section *V* for illustrations of these equation numbering options.

#### *2. Cross referencing displayed equations*

Authors will probably not cross reference every equation in text. When a numbered equation needs to be referred to in text by its number, the `\label{tag}` and `\ref{tag}` commands should be used. The `\label` command is used within the equation or the eqnarray line to be referenced.

```
input:
\begin{equation}
{\partial^2 \psi \over \partial x^2} +
{\partial^2 \psi \over \partial y^2} +
{\partial^2 \psi \over \partial z^2} = -
{\partial \psi \over \partial t}
\label{schroedinger}
\end{equation}
... It follows from Eq.\ (\ref{schroedinger}) that this is the case...
```

output:

$$\frac{\partial^2\psi}{\partial x^2}+\frac{\partial^2\psi}{\partial y^2}+\frac{\partial^2\psi}{\partial z^2}=-\frac{\partial\psi}{\partial t} \tag{1}$$

... It follows from Eq. (1) that this is the case...

Please note the parentheses surrounding the command. They are necessary for proper output. You can also label individual lines in an eqnarray. Numbers produced with `\eqnum` can also be cross referenced; just follow the `\eqnum` command with a `\label` command. See section F. Footnotes and References for further information.

### F. Footnotes and References

| | Quick Guide to References |
|---|---|
| 1. | The `\bibitem` command begins a reference. |
| 2. | References must be listed in the reference section in the order in which they are first cited, in text, figures, or tables. |
| 3. | References will automatically be numbered by REVTEX in the order in which they occur in the reference section, unless the author provides his/her own label. |

The list of references should appear after the main body of the paper. References must be numbered consecutively in the order of their first citation. Please refer to recent issues of the OSA journals for current style. The sample manuscript in Section **V** also gives some examples of a variety of reference entries.

List the references in the reference section by using the `\bibitem` command, and cite them in the text by using the `\cite` or `\onlinecite` command. A present-address footnote should appear immediately above the reference section. If there are acknowledgments, the present-address footnote should be the last item in the acknowledgments section.

Here is a sample reference.

input: `\bibitem{homer91}`G. Homer and B. T. Rogers,

`\ao {\bf 30,}` 5002-5004 (1991).

output: 1. G. Homer and B. T. Rogers, Appl. Opt. **30,** 5002- 5004 (1991).

homer91 is a tag. It can be any string of letters and numbers that you will easily associate with the reference. This tag will be used in text to tell TEX what reference you want to cite. See the example below.

input: ... This has been noted previously `\cite{homer91}`.

output: ... This has been noted previously[1].

The macro `\ao` in the above example expands to Appl. Opt., the standard abbreviation for Applied Optics. OSA has provided macros for the most common journal abbreviations used in OSA publications. The macros save typing and improve the consistent spelling of references. For a complete listing see Table 5 at the end of the sample document in Section *V*.

REVTEX has built-in features for autonumbering of section headings, equations, tables, and figures. Cross referencing depends on the use of tags that are defined by the user. Tags are strings of characters that identify the equations, tables, and figures for the purposes of the user and so that the user doesn't have to know what number REVTEX has automatically assigned to the item. The `\label` command is used to identify tags for TEX.

You will need to LATEX the original file more than once to ensure that the tags have been properly linked to appropriate numbers. If you add any tags, you will need to LATEX more than once in subsequent work sessions. LATEX will display an error message that ends with

...Rerun to get cross-reference right.

If you see that message, LATEX the file again. If the error message appears after two LATEXings, please check your labels. You probably have referred to an item in text without tagging the item.

You may not need to know (or care to know) all about what LATEX is doing for autonumbering; however, you may want to know that when you LATEX the file for the first time, an auxiliary file with the .aux filename extension will be created that connects numbers with their tags. Subsequent LATEXing accesses the auxiliary file to put the proper number in the text.

### G. Figure Captions

Figure captions are a part of the electronic manuscript and should appear after the references. They should be input sequentially in the order in which they are cited in the text; REVTEX will label and number the captions Fig. 1, Fig. 2, etc. Please place the figure captions at the end of the manuscript.

The `\label` command is used to cross reference figures in the text. This command is inserted after the text of the figure caption and before the final curly bracket.

input: \figure{Text of first caption.\label{fig1}}

\figure{This is the second caption: high-pressure Xe-

lamp spectrum as seen at the output of the Mach-Zehnder

interferometer}.\label{fig2}

output: Fig. 1. Text of first caption.

Fig. 2. This is the second caption: high-pressure

Xe-lamp spectrum as seen at the output of the Mach-

Zehnder interferometer.

Figures are cited in text with the use of the \ref command.

input: ... It can be seen from Fig. \ref{fig1} that the data

are inconsistent with this conclusion...

output: ... It can be seen from Fig. 1 that the data are

inconsistent with this conclusion...

Figures and illustrations are submitted as originals or glossy prints. Follow the rules elaborated in the Information for Contributors sections that appear in most issues of OSA's journals.

### H. Tables

Tables are a part of the electronic manuscript and should appear at the end of the file. Every table must have a complete title and the correct number of descriptive column headings. Please set all tables within a \begin{tabular} and an \end{tabular} command. Each individual table must begin with \begin{table}, and end with \end{table}.

Tables are set to 15.25 cm wide in OSA's manuscript style of REVTEX. Any usage of the \narrowtext, \mediumtext, and \widetext commands will simply be ignored, as these are not relevant to OSA's manuscript style.

See examples of tables in a current OSA journal issue for the placement of table lines. The table commands will set single horizontal lines appearing at the beginning and end of the table. A single horizontal rule should be set after the column headings with the use of the `\tableline` command. Extra sets of column headings within the table will require another `\tableline` to separate the headings from the column entries. Do not insert any other horizontal or vertical lines in the body of the table.

Since tables are automatically numbered, the `\label` command is used with the `\ref` command to cite tables in the text. The `\label` command should appear after the `\end{tabular}` and before the `\end{table}` command.

Special Table Considerations

1. Numerical columns should align on the decimal point. Use the d alignment designator.
2. Use $ delimiters for all math in a table (no displayed equation commands).
3. Footnotes in a table will automatically be labeled a, b, c, etc.
4. Extra wide tables that will not fit into the 15.25-cm width provided can be compressed by using the `\squeezetable` command.

## V . INPUT AND OUTPUT FROM A SAMPLE MANUSCRIPT

The following pages illustrate a short annotated sample of an OSA manuscript created with REVTEX. Both the input and output are presented for comparison purposes. We welcome your suggestions of sample formats or conventions that might be added to this manuscript example in the future to make it more useful to OSA's authors. Please send your ideas to

Frank E. Harris
Optical Society of America
2010 Massachusetts Ave., N.W.
Washington, D.C. 20036-1023

Telephone: (202) 416-1903
Facsimile: (202) 416-6102
E-Mail: fharris@aip.org (Internet)

In addition to examining the following sample, many OSA authors will find valuable examples in the files sample.tex, josaa.tex, josab.tex, and aplop.tex. Optics Letters authors can refer to josaa.tex or josab.tex for a style guide, and select the josaa option in the documentstyle command for their manuscripts.

The OSA template (template.tex) is a document file set up and ready to use for manuscript input. It includes all the basic section tags and formatting commands (macros) that are relevant to an OSA manuscript.

*************************************************************************

The Optical Society of America thanks you for your participation in the *REVTEX* electronic manuscript activity. Your electronic submissions will help the Society improve its capabilities and competencies to serve the OSA technical community even better in the future. Thank you.

# Title of Manuscript

A. A. Author and B. B. Author

*Authors' institution and/or address*

C. C. Author

*Second author institution and/or address*

## Abstract

In this version of the manual's sample document, each page of TEX output will be followed by a page in `\verbatim` mode showing the input that produced the facing page. This provides examples of almost everything an OSA author needs to know to produce an article. The facing page format makes it especially convenient.

### 1. First-level heading:

Here is the first sentence in Section 1, demonstrating section cross-referencing. Note that this sample file was run without the eqsecnum option selected. OSA accepts equation numbers of the form (1), (2), etc. If you wish to use numbers of the form (1.1), (1.2), etc., use the eqsecnum option.

The author will not know the received date when the compuscript is first submitted; production will insert this. Every article includes an abstract. The abstract is a concise summary of the work covered at length in the main body of the article. It is used for secondary publications and for information retrieval purposes. OSA will enter the received date.

```
% This is the file MANUAL2.TEX , MODIFIED TO TEST OSA MACROS
% from version 3.0 of the REVTeX macro package.
%                *** !!!!!!!! 3.0 !!!!!!!! ***
% This file is part of a compuscript toolbox distributed by
% APS and OSA in conjunction with the TeX author-prepared program.
% All rights not specifically granted are reserved.
% Copyright (c) 1992 Optical Society of America.
%
% For more information, see the README file.
% Filename: manual2.tex
\documentstyle[manuscript,osa]{revtex}
\def\btt#1{{\tt$\backslash$#1}}
\newcommand{\MF}{{\large{\manual META}\-{\manual FONT}}}
\newcommand{\manual}{rm}  % Replace the manual font with rm (Roman)
\newcommand\bs{\char '134 }  % add backslash char to \tt font
%
\begin{document}

\title{Title of Manuscript}
\author{A. A.  Author and B. B. Author}
\address{Authors' institution and/or address}

\author{C. C. Author}
\address{Second author institution and/or address}


\maketitle      %% ESSENTIAL IF TITLE, AUTHOR, OR DATE ARE TO APPEAR

\begin{abstract}
In this version of the manual's sample document, each page of \TeX\
output will be followed by a page in \btt{verbatim} mode showing
the input that produced the facing page.  This provides examples
of almost  everything an OSA author needs to know to produce an
article.  The facing page format makes it especially convenient.
\end{abstract}

\section{First-level heading:}
\label{sec:level1}

Here is the first sentence in Section \ref{sec:level1}, demonstrating
section cross-referencing. Note that this sample file was run
without the eqsecnum option selected.  OSA accepts equation numbers
of the form (1), (2), etc.  If you wish to use numbers of the form
(1.1), (1.2), etc., use the eqsecnum option.


The author will not know the received date when the compuscript
is first submitted; production will insert this. Every
article includes an abstract.  The abstract is a concise
summary of the work covered at length
in the main body of the article.
It is used for secondary publications and for information retrieval
purposes.  OSA will enter the received date.
```

## A. Second-level heading:

Here is the first sentence in Section 1 A, demonstrating section cross-referencing. The commands `\section` and `\subsection` are used to start sections and subsections. You should follow the section command with the section title, enclosed in curly brackets.

If you wish to cross-reference a section, follow the section command with a `\label{Your-section-name}` command. A blank input line tells TEX that a new paragraph begins.

Reference citations in text use the command `\cite`. In the reference section of this paper each reference is "tagged" by a string (in curly brackets). The proper form for citing in text is `\cite{`*string*`}`, and the result is shown here.[1,2] We will cite other people[1,3] and journals here. We also cite other people again (Refs. 1 and 3). To get reference numbers that appear on the line, use the `\onlinecite` command.

It is worth mentioning that REVTEX "collapses" lists of reference numbers where possible. We now cite everyone together,[1–3] and once again (Refs. 1–3).

# 2. Displayed equations

## A. Another second-level heading

### *1. Third-level heading:*

Here is the first sentence in Section 2 A 1, demonstrating section cross-referencing. In LATEX there are many different ways to display equations, and a few preferred ways are noted below.

Below we have indented, single-line equations with numbers; this is the most common type of equation in **OSA** journals:

$$\chi_+(p) \lesssim [2|\mathbf{p}|(|\mathbf{p}|+p_z)]^{-1/2} \begin{pmatrix} |\mathbf{p}|+p_z \\ px+ip_y \end{pmatrix} , \tag{1}$$

```
\subsection{Second-level heading:}
\label{sec:level2}

Here is the first sentence in Section \ref{sec:level2}, demonstrating
section cross-referencing.
The commands \btt{section} and \btt{subsection} are used to start
sections and subsections. You should follow the section command with
the section title, enclosed in curly brackets.

If you wish to cross-reference a section,
follow the section command with a \btt{label\{ Your-section-name\}}
command. A blank input line tells \TeX\ that a new paragraph begins.

Reference citations in text use the command \btt{cite}.
In the reference section of this paper
each reference is ``tagged'' by a string (in curly brackets).
The proper form for citing in text is
\btt{cite}$\{${\it string}$\}$,
and the result is shown here \cite{smith82,jones78}.
We will cite  other people \cite{smith82,jonessmith80}
and journals here. We also cite other people again (Refs.\
\onlinecite{smith82} and \onlinecite{jonessmith80}).  To get
reference numbers that appear on the line, use the \btt{onlinecite}
command.

It is worth mentioning that  REV\TeX\ ``collapses'' lists
of reference numbers where possible.  We now cite
everyone together, \cite{smith82,jones78,jonessmith80} and once again
(Refs.\ \onlinecite{smith82,jones78,jonessmith80}).


\section{Displayed equations}
\subsection{Another second-level heading}
\subsubsection{Third-level heading:}
\label{sec:level3}

Here is the first sentence in Section\ \ref{sec:level3}, demonstrating
section cross-referencing.
In \LaTeX\ there are many different ways to display equations, and a
few preferred ways are noted below.

Below we have indented, single-line equations with numbers; this is
the most common type of equation in {\bf OSA} journals:
\begin{equation}
\chi_+(p)\alt{\bf [}2|{\bf p}|(|{\bf p}|+p_z){\bf ]}^{-1/2}
\left(\begin{array}{c}
|{\bf p}|+p_z\\
px+ip_y
\end{array}\right)\;,
\end{equation}
```

$$\left\{ \mathbb{1}234567890abc123\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2}\right\}, \tag{2}$$

Note the outline numeral one in Eq. (2). If the equation is a little wider, the equation number automatically moves down to the next line:

$$\left\{ abc1234567890abc1234\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2}abc1234567890abc1234\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2}\right\}. \tag{3}$$

When the `\label` command is used [cf. input for Eq. (2)], the equation can be referred to in text without your knowing the equation number that TEX will assign to it.

Math will be flush left by default, in OSA submissions. It should allow longer equations to be displayed before line numbers are displayed below.

$$\left\{ ab12345678abc123456abcdef\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2}\right\}, \tag{4}$$

$$\epsilon_\mu^*(p) \to c(V)D_V\sum_\tau c_\tau^f \bar{u}(f)P_\tau\gamma_\mu v(\bar{f})\ [\epsilon_j l_i\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1)\ . \tag{5}$$

If you have a single-line equation that you don't want numbered, you can use the `\[`, `\]` format:

$$g^+g^+ \to g^+g^+g^+g^+\dots\ ,\quad q^+q^+ \to q^+g^+g^+\dots\ .$$

### *2. Multiline equations*

Multiline equations are obtained by using the `\begin{eqnarray}`, `\end{eqnarray}` format. Use the `\nonumber` command at the end of each line where you do not want a number:

$$\begin{aligned} \mathcal{M} = \quad & ig_Z^2(4E_1E_2)^{1/2}(l_i^2)^{-1}\delta_{\sigma_1,-\sigma_2}(g_{\sigma_2}^e)^2\chi_{-\sigma_2}(p_2) \\ & \times[\epsilon_j l_i\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1), \end{aligned} \tag{6}$$

$$\begin{aligned} \sum|M_g^{\rm viol}|^2 = \ & g_S^{2n-4}(Q^2)\ N^{n-2}(N^2-1) \\ & \times\left(\sum_{i<j}\right)\sum_{\rm perm}\frac{1}{S_{12}}\frac{1}{S_{12}}\sum_\tau c_\tau^f\ . \end{aligned} \tag{7}$$

```
\begin{equation}
\left\{\openone234567890abc123\alpha\beta\gamma\delta%
1234556\alpha\beta{1\sum^{a}_{b}\over A^2}\right\}\label{one},
\end{equation}
Note the open one in Eq.\ (\ref{one}).
If the equation is a little wider, the equation number automatically
moves down to the next line:
\begin{equation}
\left\{abc1234567890abc1234\alpha\beta\gamma\delta1234556\alpha\beta%
{1\sum^{a}_{b}\over A^2}abc1234567890abc1234\alpha\beta\gamma\delta%
1234556\alpha\beta{1\sum^{a}_{b}\over A^2}\right\}.
\end{equation}
When the \btt{label} command is used [cf. input for Eq. (\ref{one})],
the equation can be referred to in text without your knowing the
equation number that \TeX\ will assign to it.

Math will be flush left by default, in OSA submissions.
It should allow longer equations to be displayed before line numbers
are displayed below.

\begin{equation}
\left\{ab12345678abc123456abcdef\alpha\beta\gamma\delta%
1234556\alpha\beta{1\sum^{a}_{b}\over A^2}\right\},
\end{equation}
\begin{equation}
\epsilon^\ast_\mu(p)\to c(V)D_V \sum_\tau c^f_\tau \bar
u(f)P_\tau \gamma_\mu v( \bar f)\;
[\epsilon_jl_i\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1)\;.
\end{equation}

If you have a single-line equation that you don't want
numbered, you can use the \btt{[}, \btt{]} format:
\[g^+g^+ \rightarrow g^+g^+g^+g^+ \dots ~,~~q^+q^+\rightarrow
q^+g^+g^+ \dots ~. \]

\subsubsection{Multiline equations}
Multiline equations are obtained by using the
\btt{begin$\{$eqnarray$\}$}, \btt{end$\{$eqnarray$\}$} format.
Use the \btt{nonumber}
command at the end of each line where you do not want a number:
\begin{eqnarray}
{\cal M}=&&ig_Z^2(4E_1E_2)^{1/2}(l_i^2)^{-1}
\delta_{\sigma_1,-\sigma_2}
(g_{\sigma_2}^e)^2\chi_{-\sigma_2}(p_2)\nonumber\\
&&\times [\epsilon_jl_i\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1), \\
\sum \vert M^{\rm viol}_g \vert ^2&=&g^{2n-4}_S(Q^2)~N^{n-2}
        (N^2-1)\nonumber \\
 & &\times \left( \sum_{i<j}\right)
  \sum_{\rm perm}
 {1 \over S_{12}}
 {1 \over S_{12}}\sum_\tau c^f_\tau~.
\end{eqnarray}
```

If you wish to set a multiline equation without any line numbers, you can use the `\begin{eqnarray*}`, `\end{eqnarray*}` format:

$$\begin{aligned}\sum |M_g^{\rm viol}|^2 = {} & g_S^{2n-4}(Q^2)\ N^{n-2}(N^2-1) \\ & \times \left( \sum_{i<j} \right) \left( \sum_{\rm perm} \frac{1}{S_{12}S_{23}S_{n1}} \right) \frac{1}{S_{12}}\ .\end{aligned}$$

To obtain numbers not normally produced by the automatic numbering, use the `\eqnum{#1}` command, where `#1` is the desired equation number. For example, to get an equation number of (2.7′),

$$g^+g^+ \rightarrow g^+g^+g^+g^+ \dots\ , \quad q^+q^+ \rightarrow q^+g^+g^+ \dots\ . \tag{2.7′}$$

*A few notes on* `\eqnum`. The `\eqnum` must come before the `\label`, if any. The numbering set with `\eqnum` is *transparent* to the automatic numbering in REVTEX; therefore you must know the number ahead of time and *must* make sure that the number set with `\eqnum` stays in step with the automatic numbering. `\eqnum` works with both single-line and multiline equations. You could, if you wished, do all the numbering in a paper manually with `\eqnum`. Enclosing single-line and multiline equations in `\begin{mathletters}` and `\end{mathletters}` will produce a set of equations that are “numbered” with letters, as shown in Eqs. (8a) and (8b) below:

$$\left\{ abc123456abcdef\alpha\beta\gamma\delta1234556\alpha\beta \frac{1\sum_b^a}{A^2} \right\}, \tag{8a}$$

$$\begin{aligned}{\cal M} = {} & ig_Z^2(4E_1E_2)^{1/2}(l_i^2)^{-1}(g_{\sigma_2}^e)^2\chi_{-\sigma_2}(p_2) \\ & \times[\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1).\end{aligned} \tag{8b}$$

```
If you wish to set a multiline equation without any line numbers,
you can use the \verb+\begin{eqnarray*}+,
\verb+\end{eqnarray*}+ format:
\begin{eqnarray*}
\sum \vert M^{\rm viol}_g \vert ^2&=&g^{2n-4}_S(Q^2)~N^{n-2}
        (N^2-1)\\
 & &\times \left( \sum_{i<j}\right)
 \left( \sum_{\rm perm}
 {1 \over S_{12}S_{23}S_{n1}}\right)
 {1 \over S_{12}}~.
\end{eqnarray*}
To obtain numbers not normally produced by the automatic numbering,
use the \verb+\eqnum{#1}+ command, where \verb+#1+ is the desired
equation number. For example, to get an equation number of
(\ref{eq:mynum}),
\begin{equation}
g^+g^+ \rightarrow g^+g^+g^+g^+ \dots ~,~~q^+q^+\rightarrow
q^+g^+g^+ \dots ~. \eqnum{2.7$'$}\label{eq:mynum}
\end{equation}

{\it A few notes on} \verb=\eqnum=.
The \verb+\eqnum+ must come before the \verb+\label+, if any.
The numbering set with \verb+\eqnum+ is {\it transparent} to the
automatic numbering in REV\TeX; therefore
you must know the number ahead of time and {\it must\/} make
sure that the number set with \verb+\eqnum+ stays in step
with the automatic numbering.
\verb+\eqnum+ works with both single-line and multiline equations.
You could, if you wished, do all the numbering in a paper
manually with \verb+\eqnum+.
Enclosing single-line and multiline equations in \btt{begin\{mathletters\}}
and \btt{end\{mathletters\}} will produce
a set of equations that are ``numbered'' with letters, as shown
in Eqs.\ (\ref{mlett:1}) and (\ref{mlett:2}) below:
\begin{mathletters}
\begin{equation}
\left\{abc123456abcdef\alpha\beta\gamma\delta%
1234556\alpha\beta{1\sum^{a}_{b}\over A^2}\right\},\label{mlett:1}
\end{equation}
\begin{eqnarray}
{\cal M}=&&ig_Z^2(4E_1E_2)^{1/2}(l_i^2)^{-1}
(g_{\sigma_2}^e)^2\chi_{-\sigma_2}(p_2)\nonumber\\
&&\times
[\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1).\label{mlett:2}
\end{eqnarray}
\end{mathletters}
```

### B. New Printing Characters for OSA

The following are composite characters, created by short macros included in the osa.sty style file.

$\gtrsim$ $\lesssim$ $\triangleq$

$\lambdabar$ $^1\!/_2$, $^2\!/_3$, etc.

The macros to produce these special characters are shown in Table 1, at the end of this document.

## 3. Cross-referencing

REVTEX will automatically number sections, equations, figure captions, and tables. In order to reference them in text, use the `\label` and `\ref` commands.

The `\label` command appears following a section heading or within a equation, figure caption, or table; the `\ref` command appears in text where citation is to occur. We will refer to the first figure (Fig. 1) here. We can refer to the "late figure" also (Fig. 2).

References to figures: Fig. 1, Fig. 2 and Fig. 3.

References to tables: Table 1, Table 2, Table 3, and Table 4. **OSA** style requires that the initial citation of figures or tables be in numerical order in text, so don't cite Fig. 3 until you've cited Fig. 2. See *Style and Notation Guide*.

## 4. Tables

In manuscript format, tables should be placed at the end of the submission, after the figure captions. The tables that were once in this location have been placed at the end of the document.

```
\subsection{New Printing Characters for OSA}
The following are composite characters, created by short macros
included in the OSA.STY style file.
\begin{eqnarray*}
\begin{array}{rrrr}
\,\,\,\,\,\, \succsim & \,\,\,\,\, \precsim &
\,\,\,\,\,\, \corresponds &\\
\,\,\,\,\,\, \lambdabar & \,\,\,\,\,\,  \slantfrac{1}{2} &
\,\,\,\,\,\, \slantfrac{2}{3},& \,\,\, {\rm etc.}
\end{array}
\end{eqnarray*}

The macros to produce these special characters are shown in Table
\ref{table1}, at the end of this document.

\section{Cross-referencing}
REV\TeX\ will automatically number sections, equations,
figure captions, and tables. In order to
reference them in text, use the \btt{label} and \btt{ref}
commands.

The \btt{label} command appears following a section heading
or within a equation, figure
caption, or table; the \btt{ref} command appears in text
where citation is to occur.  We will refer to the first
figure (Fig.~\ref{autonum}) here.
We can refer to the ``late figure'' also (Fig.~\ref{latefigure}).

References to figures: Fig.~\ref{autonum}, Fig.~\ref{latefigure}
and Fig.~\ref{reduced}.

References to tables:
Table \ref{table1},
Table \ref{table2},
Table \ref{table3},   and
Table \ref{latetable}.
{\bf OSA}
style requires that the initial citation of figures or tables
be in numerical order in text, so don't cite Fig.~\ref{reduced}
until you've cited Fig.~\ref{latefigure}.
See {\it Style and Notation
Guide}.

\section{Tables}
In manuscript format, tables should be placed at the end of the submission,
after the figure captions. The tables that were once in this location
have been placed at the end of the document.
```

Tables must begin with a "\begin{table}" command. This starts the table environment, which may contain several tables. A "\begin{tabular}{}" is used to start the actual table. "\end{tabular}" and "\end{table} are used to end the table and the table environment.

The command \caption{Your Caption} is used to create a caption for a table. It should be used just prior to the \begin{tabular}{} command.

The second set of braces following {tabular} must contain information to indicate the number of columns and the type of justification you wish to use. The information is conveyed by letters. Each letter within the braces indicates one column in the table. The value of the letter indicates the kind of justification.

Some examples include c for centered, l for left justification, r for right justification, and d for decimal, where numbers will be lined up according to their decimal points.

## ACKNOWLEDGMENTS

For the Acknowledgments section use the command \acknowledgments to produce the heading. The section number will not appear.

If you want to suppress section numbers (as in the Acknowledgments section), the command \section* can be used. This has already been done by the \acknowledgments macro, so the \section* command is not needed in this case.

## Appendix: A

To start appendixes, you should use the command \appendix, followed by the command \section{}. Please note the equation numbers in an appendix: Note that the letters and numbers switch places and functions in the appendix.

$$\mathrm{P} = mc, \tag{(A1)}$$

$$\mathrm{E} = mc^2. \tag{(A2)}$$

```
Tables must begin with a \verb+"\begin{table}"+ command.
this starts the table environment, which may contain several
tables. A \verb+"\begin{tabular}{}"+ is used to start the actual table.
\verb+"\end{tabular}"+ and \verb+"\end{table}+ are used to
end the table and the table environment.

The command \btt{caption\{Your Caption\}} is used to create a caption
for a table. It should be used just prior to the \btt{begin\{tabular\}\{\}}
command.

The second set of braces following \{tabular\} must contain
information to indicate the number of columns and the type of justification
you wish to use.  The information is conveyed by letters. Each letter
within the braces indicates one column in the table.  The value of the
letter indicates the kind of justification.

Some examples include c for centered, l for left justification,
r for right justification, and d for decimal, where numbers will
be lined up according to their decimal points.

\acknowledgments

 For the Acknowledgments section  use the command
\verb+\acknowledgments+ to produce the heading.  The section number
will not appear.

If you want to suppress section numbers (as in the Acknowledgments
section), the command \btt{section*\{\}} can be used. This has already
been done by the
\verb+\acknowledgments+ macro, so the \btt{section*\{\}} command is not
needed in this case.

\appendix
\section{}

To start appendixes, you should use the command
\verb+\appendix+, followed by the command \verb+\section{}+.
Please note the equation numbers in an appendix:  Note that the
letters and numbers switch places and functions in the appendix.
\begin{eqnarray}
{\rm P} = mc, \\
{\rm E} = mc^2.
\end{eqnarray}
```

Either the `\begin{eqnarray}` (as above) or the `\begin{equation}` (as below) command may be used to start the equations, in the appendix. The appropriate ending command must also be given, of course.

$$\mathrm{E} = \tfrac{1}{2}mv^2. \qquad ((\mathrm{A3}))$$

**Appendix: B**

The following section demonstrates a book reference, a journal reference, and a proceedings reference. Each reference should begin with the `\bibitem{Name}` command. {Name} should be a short name that can be used with the `\cite{Name}` command in the text.

The first reference is a book reference. It shows the authors, the *Title in Italics,* and the publisher, city, and year of publication in parentheses.

The second reference, for a journal, shows authors, "title in quotes," journal name, **Volume number in boldface,** complete page numbers (beginning and ending), and year in parentheses.

The third reference is a proceedings reference. The authors, "title in quotes," *proceedings name in italics,* editors, (publisher and year in parenthesis), and volume and pages.

To produce *italics*, the command sequence `{\it{Title in Italics}` was used. To produce bold type, the command `{\bf{Number in boldface}` was used. To produce right facing double quotes, 2 single quotes should be used. To produce left facing quotes, use 2 'left quote' marks. On most IBM keyboards this can be found near the number 1 at the top left corner of the keyboard.

For greater convenience and accuracy, OSA has provided a set of standard macros for some commonly used journal abbreviations. They contain special formatting commands to ensure correct spacing. They also save typing and ensure consistent spelling of the journal abbreviations.

See Table 5 for a list of journal abbreviation macros supported by the OSA style option. Other societies also use some of these keystroke saving macros.

```
Either the \btt{begin\{eqnarray\}} (as above) or the
\btt{begin\{equation\}} (as below)
command may be used to start the equations, in the appendix.  The
appropriate ending command must also be given, of course.

\begin{equation} {\rm E} = \case 1/2 mv^2. \label{appa}\end{equation}

\section{}
The following section demonstrates a book reference, a journal reference,
and a proceedings reference.  Each reference should begin with the
\btt{bibitem\{Name\}}  command.  \{Name\} should be a short name that
can be used with the \btt{cite\{Name\}} command in the text.

The first reference is a book reference. It shows the authors, the
{\it Title in Italics,} and the publisher, city and year of publication
in parenthesis.

The  second reference, for a journal, shows authors, ``title in quotes,''
journal name, {\bf Volume number in boldface,} complete page numbers
(beginning and ending), and year in parentheses.

The third reference is a proceedings reference.  The authors, ``title
in quotes,''  {\it proceedings name in italics,}
editors, (publisher and year in parenthesis), and volume and pages.

To produce {\it italics}, the command sequence
\{\btt{it\{Title in Italics\}} was used.  To produce bold type, the
command \{\btt{bf\{Number in boldface\}} was used.  To produce right
facing double quotes, 2 single quotes should be used.  To produce
left facing quotes, use 2 `left quote' marks.  On most IBM keyboards
this can be found near the number 1 at the top left corner of the
keyboard.

For greater convenience and accuracy, OSA has provided a set of standard
macros for some commonly used journal abbreviations.  They contain
special formatting commands to ensure correct spacing.  They also
save typing and ensure consistent spelling of the journal abbreviations.

See Table \ref{abbrev} for a list of journal abbreviation macros
supported by the OSA style option.  Other societies also use some
of these keystroke saving macros.
```

## REFERENCES


1. F. Zernike and J. Midwinter, *Applied Nonlinear Optics* (Wiley, New York, 1973).
2. K. W. Kirby and L. G. DeShazer "Refractive indexes of 14 nonlinear crystals isomorphic to $KH_2PO_4$," J. Opt. Soc. Am. B **4,** 1072-1078 (1987).
3. C. C. Skiscim and B. L. Golden, "Optimization by simulated annealing: a preliminary computational study for the TSP," in *Proceedings of the 1983 Winter Simulation Conference,* S. Roberts, J.Banks, and B Schmeiser, eds. (Institute of Electrical and Electronics Engineers, New York, 1983), Vol. 1, pp. 523-535.

```
\begin{references}
\bibitem{smith82}F. Zernike and J. Midwinter, {\it Applied Nonlinear
Optics} (Wiley, New York, 1973).
\bibitem{jones78}K. W. Kirby and L. G. DeShazer, ``Refractive indexes
of 14 nonlinear crystals isomorphic to ${\rm KH}_2{\rm PO}_4$,'' \josab
{\bf 4,} 1072-1078 (1987).
\bibitem{jonessmith80}C. C. Skiscim and B. L. Golden, ``Optimization
by simulated annealing: a preliminary computational study for the TSP,''
in {\it Proceedings of the 1983 Winter Simulation Conference,} S. Roberts,
J.Banks, and B Schmeiser, eds. (Institute of Electrical and Electronics
Engineers, New York, 1983), Vol.\ 1, pp. 523-535.
\end{references}
```

## FIGURES

Fig. 1. A figure caption. The figure captions are automatically numbered.

Fig. 2. The "late figure." This figure was inserted when the paper was finished. Since the figures are automatically numbered, no renumbering in text was necessary. All that needed to be done was to type the caption in the proper place and cite the figure in text.

Fig. 3. A figure caption. Figures will be reduced to an appropriate size by the production staff of the journal.

Fig. 4. A figure caption. The labels you give tables and figures can be descriptive.

```
\begin{figure}
\caption{A figure caption.  The figure captions are automatically
numbered.\label{autonum}}
\end{figure}

\begin{figure}
\caption{The ``late figure.'' This figure was inserted when the paper
was finished.  Since the figures are automatically numbered,
no renumbering in text was necessary. All that
needed to be done was to type the caption in the
proper place and cite the figure in text.\label{latefigure}}
\end{figure}

\begin{figure}
\caption{A figure caption. Figures will be reduced to an appropriate
size by  the production staff of the journal.\label{reduced}}
\end{figure}

\begin{figure}
\caption{A figure caption.  The labels you give tables and figures
can be descriptive.} %%%%
\label{figure4}%%%%
\end{figure}
```

# TABLES

Table 1. OSA special characters and the macros to produce them. (This is a small table, which would occupy the width of a narrow column in the finished article. In manuscripts all tables will be displayed with the same width you see here. Also, table captions are automatically numbered.)

| Macro | Character |
|---|---|
| `\corresponds` | $\triangleq$ |
| `\lambdabar` | $\lambdabar$ |
| `\succsim` | $\succsim$ |
| `\precsim` | $\precsim$ |
| `\slantfrac{1}{2}`[a] | $^1\!/_2$ |

[a]Replace 1 and 2 with your numbers.

Table 2. A table with math characters. Two alternative occupations of special positions by $KMnCL_3$ ions in the two space groups $D^1_{4h}$ and $D^1_{4h}$. For a special value of the $x$ and $y$ parameters, a set of special positions may split into two sets of special positions of higher symmetry. This table's footnote was inserted using the "tablenote" command at the point of insertion.

| | $D^1_{4h}$ | | $D^5_{4h}$ | |
|---|---|---|---|---|
| Ion | 1st alternative | 2nd alternative | lst alternative | 2nd alternative |
| K | $(2e)+(2f)$ | $(4i)$ | $(2c)+(2d)$ | $(4f)$ |
| Mn | $(2g)$ | $(a)+(b)+(c)+(d)$ | $(4e)$ | $(2a)+(2b)$ |
| Cl | $(a)+(b)+(c)+(d)$ | $(2g)$+$(2h)$ | $(a)+(2b)$ | $(4e)$ [a] |
| He | $(8r)$ | $(4j)$ | $(4g)$ | |
| Ag | | $(4k)$ | | $(4h)$ |

[a]The $z$ parameter of these positions is $z \sim {}^1\!/_4$.

```
\begin{table}
\caption{OSA special characters and the macros to produce them.
(This is a small table, which would occupy the width of a
narrow column in the finished article.
In manuscripts all tables
will be displayed with the same width you see here.
Also, table captions are automatically numbered.)}
\begin{tabular}{lr}
Macro & Character\\
\tableline
\verb+\corresponds+&$\corresponds$ \\
\verb+\lambdabar +&$\lambdabar$   \\
\verb+\succsim +&$\succsim $ \\
\verb+\precsim +&$\precsim$  \\
\verb+\slantfrac{1}{2}+\tablenote{Replace 1 and 2 with your numbers.}
&$\slantfrac{1}{2}$
\end{tabular}
\label{table1}
\end{table}
```

```
\begin{table}
\caption{A table with math characters.  Two alternative
occupations of special positions
by KMnCL$_3$ ions in the two space groups $D_{4h}^1$ and $D_{4h}^1$.
  For a special value of the $x$ and $y$ parameters, a
set of special positions may
split into two sets of special positions of higher symmetry.
This table's footnote was inserted using the "tablenote"
command at the point of insertion.}
\begin{tabular}{ccccc}
 &\multicolumn{2}{c}{$D_{4h}^1$}&\multicolumn{2}{c}{$D_{4h}^5$}\\
 \cline{2-3}   \cline{4-5}
 Ion&1st alternative&2nd alternative&lst alternative
&2nd alternative\\ \tableline
 K&$(2e)+(2f)$&$(4i)$&$(2c)+(2d)$&$(4f)$\\
 Mn&$(2g)$&$(a)+(b)+(c)+(d)$&$(4e)$&$(2a)+(2b)$\\
 Cl&$(a)+(b)+(c)+(d)$&$(2g)$+$(2h)$&$(a)+(2b)$&$(4e)$
\tablenote{The $z$ parameter of these positions is
  $z\sim\kern-1em\slantfrac{1}{4}$.}\\
 He&$(8r)$&$(4j)$&$(4g)$\\   %
 Ag& &$(4k)$& &$(4h)$\\
 \end{tabular}
 \label{table2}    % for cross references, only
 \end{table}
```

Table 3. Another table. This shows decimal and implied-decimal alignments. Predecimal zeros are required according to OSA style.

| One | Two | Three | Four | Five |
|---|---|---|---|---|
| one | two | three | four | five |
| He[a] | 2 | 2.772 | 45672.554 | 0.691 |
| C | Ca[b] | 12537.649 | 37.663 | 86.378 |

[a]Some tables require footnotes.

[b]Some tables need more than one footnote.

Table 4. A "late table." This table was added after most of the paper had been completed. Since the tables are automatically numbered, no renumbering in text was necessary. This table was added to show the use of the d specifier for lining things up. This time I am going to use the tablenotemark command in the body of the table and the tablenotetext command at the end. This permits multiple citations of the same reference.

| | Align by . | Multiple alignments | | | |
|---|---|---|---|---|---|
| Glass | 1.89[a] | 1.45 | 23.66[b] | 0 | 0.002 |
| Water | 1.00 | 1.35 | 100.00[a] | 344 | [c] |
| Wood | 0.87 | 0.00[a b] | 7.80 | 45 | 0.316 |

[a]Here we cite Ref. 2.

[b]By the way, these are fictitious numbers.

[c]These are fictitious numbers also.

```
\begin{table}
\setdec 00.00
\caption{Another table.  This shows decimal and implied-decimal
alignments. Predecimal zeros are required according to OSA style.}
\begin{tabular}{llcdcc}
One&Two&Three&Four&Five\\
\tableline
one&two&three&four&five\\
He\tablenote{Some tables require footnotes.}&2&\dec 2.772
& 45672.554 & 0.691 \\
C&Ca\tablenote{Some tables need more than one footnote.}
& 12537.649 & 37.663 &\dec 86.378 \\
\end{tabular}  %%
\label{table3}
\end{table}

\begin{table}
\caption{A ``late table.''  This table was added after most of the
paper had been completed. Since the tables are
automatically numbered, no renumbering in text was necessary. This
table was added to show the use of the d specifier for lining
things up. This time I am going to use the tablenotemark command in the
body of the table, and the tablenotetext command at the end.  This
permits multiple citations of the same reference.}
\begin{tabular}{l|dddrd}
\multicolumn{2}{c}{Align by .}&
  \multicolumn{4}{c}{Multiple alignments}\\
\tableline
Glass& 1.89\tablenotemark[1]& 1.45& 23.66\tablenotemark[2]& 0& 0.002\\
Water& 1.00& 1.35& 100.00\tablenotemark[1]& 344& \tablenotemark[3]  \\
Wood & 0.87& 0.00\tablenotemark[1]\tablenotemark[2]& 7.80& 45& 0.316\\
\end{tabular}
\label{latetable}
\tablenotetext[1]{Here we cite Ref.\ \onlinecite{jones78}.}
\tablenotetext[2]{By the way, these are fictitious numbers.}
\tablenotetext[3]{These are fictitious numbers also.}
\end{table}
```

Table 5. OSA Journal abbreviations and the macros to produce them. Unfortunately, in manuscript style this table will not fit on 1 page. The input for this table starts below the last lines of output, on the facing page.

| Macro | Output |
|---|---|
| `\ao` | Appl. Opt. |
| `\ap` | Appl. Phys. |
| `\apl` | Appl. Phys. Lett. |
| `\apj` | Astrophys. J. |
| `\bell` | Bell Syst. Tech. J. |
| `\jqe` | IEEE J. Quantum Electron. |
| `\assp` | IEEE Trans. Acoust. Speech Signal Process. |
| `\aprop` | IEEE Trans. Antennas Propag. |
| `\mtt` | IEEE Trans. Microwave Theory Tech. |
| `\iovs` | Invest. Ophthalmol. Vis. Sci. |
| `\jcp` | J. Chem. Phys. |
| `\jmo` | J. Mod. Opt. |
| `\josa` | J. Opt. Soc. Am. |
| `\josaa` | J. Opt. Soc. Am. A |
| `\josab` | J. Opt. Soc. Am. B |
| `\jpp` | J. Phys. (Paris) |
| `\nat` | Nature (London) |
| `\oc` | Opt. Commun. |
| `\ol` | Opt. Lett. |
| `\pl` | Phys. Lett. |
| `\pra` | Phys. Rev. A |
| `\prb` | Phys. Rev. B |
| `\prl` | Phys. Rev. Lett. |

| | |
|---|---|
| `\pspie` | Proc. Soc. Photo-Opt. Instrum. Eng. |
| `\sjqe` | Sov. J. Quantum Electron. |
| `\vr` | Vision Res. |

```
\begin{table}
\caption{OSA Journal abbreviations and the macros to produce them.}
\begin{tabular}{ll}
Macro & Output\\
\tableline
\verb+\ao  + & \ao  \\
\verb+\ap  + & \ap  \\
\verb+\apl  + & \apl  \\
\verb+\apj  + & \apj  \\
\verb+\bell  + & \bell  \\
\verb+\jqe  + & \jqe  \\
\verb+\assp  + & \assp  \\
\verb+\aprop  + & \aprop  \\
\verb+\mtt  + & \mtt  \\
\verb+\iovs  + & \iovs  \\
\verb+\jcp  + & \jcp  \\
\verb+\jmo  + & \jmo  \\
\verb+\josa  + & \josa  \\
\verb+\josaa  + & \josaa  \\
\verb+\josab  + & \josab  \\
\verb+\jpp  + & \jpp  \\
\verb+\nat  + & \nat  \\
\verb+\oc  + & \oc  \\
\verb+\ol  + & \ol  \\
\verb+\pl  + & \pl  \\
\verb+\pra  + & \pra  \\
\verb+\prb  + & \prb  \\
\verb+\prl  + & \prl  \\
\verb+\pspie  + & \pspie  \\
\verb+\sjqe  + & \sjqe  \\
\verb+\vr  + & \vr  \\
\end{tabular}
\label{abbrev}
\end{table}
\end{document}
```