



## 2. Example citations

Here I give simple examples of each use. First, I will insert an equation.

$$y = mx + b \quad (1)$$

This is the standard slope-intercept form of a line. So later in the text you can refer to this equation, without knowing its equation number, because you do know its label (the name you gave it). The slope-intercept form of a line is given by Eqn. 1.

Now suppose I want to mention some work done by someone else, and they have published it in a journal. Ferd Berwick first investigated the flux capacitor in 1963. His results [3] are interesting for any physics student.

You can also refer the reader to a specific section of this article, this is cross referencing. Section III on page 3 is a subsequent section on Cross Referencing. Look at the `LATEX` source code to see how I did this without knowing what page the referenced section would end up on, and it automatically gets updated in the typesetting process if I edit the document and the section ends up on another page.

## II. MATH AND EQUATIONS

Inline math may be typeset using the `$` delimiters. Bold math symbols may be achieved using the `bm` package and the `\bm{#1}` command it supplies. For instance, a bold  $\alpha$  can be typeset as `\bm{\alpha}` giving  $\alpha$ . Fraktur and Blackboard (or open face or double struck) characters should be typeset using the `\mathfrak{#1}` and `\mathbb{#1}` commands respectively. Both are supplied by the `amssymb` package. For example, `\mathbb{R}` gives  $\mathbb{R}$  and `\mathfrak{G}` gives  $\mathfrak{G}$ .

In `LATEX` there are many different ways to display equations, and a few preferred ways are noted below. Displayed math will center by default. Use the class option `fleqn` to flush equations left.

Below we have numbered single-line equations; this is the most common type of equation in *Physical Review*:

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

$$\left\{ 1234567890abc123\alpha\beta\gamma\delta123456\alpha\beta\frac{1\sum_b^a}{A^2} \right\}. \quad (3)$$

Note the open one in Eq. (3).

Not all numbered equations will fit within a narrow column this way. The equation number will move down automatically if it cannot fit on the same line with a one-line equation:

$$\left\{ ab12345678abc123456abcdef\alpha\beta\gamma\delta123456\alpha\beta\frac{1\sum_b^a}{A^2} \right\}. \quad (4)$$

When the `\label{#1}` command is used [cf. input for Eq. (3)], the equation can be referred to in text without knowing the equation number that `TEX` will assign to it. Just use `\ref{#1}`, where `#1` is the same name that used in the `\label{#1}` command.

Unnumbered single-line equations can be typeset using the `\[, \]` format:

$$g^+g^+ \rightarrow g^+g^+g^+g^+ \dots, \quad q^+q^+ \rightarrow q^+g^+g^+ \dots$$

### A. Multiline equations

Multiline equations are obtained by using the `eqnarray` environment. Use the `\nonumber` command at the end of each line to avoid assigning a number:

$$\mathcal{M} = ig_Z^2 (4E_1 E_2)^{1/2} (l_i^2)^{-1} \delta_{\sigma_1, -\sigma_2} (g_{\sigma_2}^e)^2 \chi_{-\sigma_2}(p_2) \times [\epsilon_j l_i \epsilon_i]_{\sigma_1} \chi_{\sigma_1}(p_1), \quad (5)$$

$$\sum |M_g^{\text{viol}}|^2 = g_S^{2n-4} (Q^2)^{N^{n-2}} (N^2 - 1) \times \left( \sum_{i < j} \right) \sum_{\text{perm}} \frac{1}{S_{12}} \frac{1}{S_{12}} \sum_{\tau} c_{\tau}^f. \quad (6)$$

**Note:** Do not use `\label{#1}` on a line of a multiline equation if `\nonumber` is also used on that line. Incorrect cross-referencing will result. Notice the use `\text{#1}` for using a Roman font within a math environment.

To set a multiline equation without *any* equation numbers, use the `\begin{eqnarray*}`, `\end{eqnarray*}` format:

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

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

$$(2.6'),$$

$$g^+g^+ \rightarrow g^+g^+g^+g^+ \dots, \quad q^+q^+ \rightarrow q^+g^+g^+ \dots \quad (2.6')$$

*a. A few notes on tags* `\tag{#1}` requires the `amsmath` package. Place the `\tag{#1}` command before the `\label{#1}`, if any. The numbering produced by `\tag{#1}` does not affect the automatic numbering in `REVTEX`; therefore, the number must be known ahead of time, and it must be manually adjusted if other equations are added. `\tag{#1}` works with both single-line and multiline equations. `\tag{#1}` should only be used in exceptional cases—do not use it to number many equations in your paper. Please note that this feature of the

amsmath package is *not* compatible with the hyperref (6.77u) package.

Enclosing `display math` within `\begin{subequations}` and `\end{subequations}` will produce a set of equations that are labeled with letters, as shown in Eqs. (7b) and (7a) below. You may include any number of single-line and multiline equations, although it is probably not a good idea to follow one `display math` directly after another.

$$\mathcal{M} = ig_Z^2 (4E_1 E_2)^{1/2} (l_i^2)^{-1} (g_{\sigma_2}^e)^2 \chi_{-\sigma_2}(p_2) \times [\epsilon_i]_{\sigma_1} \chi_{\sigma_1}(p_1). \quad (7a)$$

$$\mathcal{R}^{(d)} = g_{\sigma_2}^e \left( \frac{[\Gamma^Z(3, 21)]_{\sigma_1}}{Q_{12}^2 - M_W^2} + \frac{[\Gamma^Z(13, 2)]_{\sigma_1}}{Q_{13}^2 - M_W^2} \right) + x_W Q_e \left( \frac{[\Gamma^\gamma(3, 21)]_{\sigma_1}}{Q_{12}^2 - M_W^2} + \frac{[\Gamma^\gamma(13, 2)]_{\sigma_1}}{Q_{13}^2 - M_W^2} \right). \quad (8)$$

This is typed to show how the output appears in wide format. (Incidentally, since there is no blank line between the `equation` environment above and the start of this paragraph, this paragraph is not indented.)

### III. CROSS-REFERENCING

REVTeX will automatically number such things as sections, footnotes, equations, figure captions, and table captions. In order to reference them in text, use the `\label{#1}` and `\ref{#1}` commands. To reference a particular page, use the `\pageref{#1}` command.

The `\label{#1}` should appear within the section heading, within the footnote text, within the equation, or within the table or figure caption. The `\ref{#1}` command is used in text at the point where the reference is to be displayed. Some examples: Section I on page 1, Table I, and Fig. 1.

TABLE I. A table that fits into a single column of a two-column layout. Note that REVTeX 4 adjusts the intercolumn spacing so that the table fills the entire width of the column. Table captions are numbered automatically. This table illustrates left-, center-, decimal- and right-aligned columns, along with the use of the `ruledtabular` environment which sets the Scotch (double) rules above and below the alignment, per APS style.

Left <sup>a</sup>	Centered <sup>b</sup>	Decimal	Right
1	2	3.001	4
10	20	30	40
100	200	300.0	400

<sup>a</sup> Note a.

<sup>b</sup> Note b.

$$\left\{ abc123456abcdef\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2} \right\}, \quad (7b)$$

Giving a `\label{#1}` command directly after the `\begin{subequations}`, allows you to reference all the equations in the `subequations` environment. For example, the equations in the preceding `subequations` environment were Eqs. (7).

#### 1. Wide equations

The equation that follows is set in a wide format, i.e., it spans the full page. The wide format is reserved for long equations that cannot easily be set in a single column:

## IV. FLOATS: FIGURES, TABLES, VIDEOS, ETC.

Figures and tables are usually allowed to “float”, which means that their placement is determined by L<sup>A</sup>T<sub>E</sub>X, while the document is being typeset.

Use the `figure` environment for a figure, the `table` environment for a table. In each case, use the `\caption` command within to give the text of the figure or table caption along with the `\label` command to provide a key for referring to this figure or table. The typical content of a figure is an image of some kind; that of a table is an alignment.

Insert an image using either the `graphics` or `graphicx` packages, which define the `\includegraphics{#1}` command. (The two packages differ in respect of the optional arguments used to specify the orientation, scaling, and translation of the image.) To create an alignment, use the `tabular` environment.

The best place to locate the `figure` or `table` environment is immediately following its first reference in text; this sample document illustrates this practice for Fig. 1,

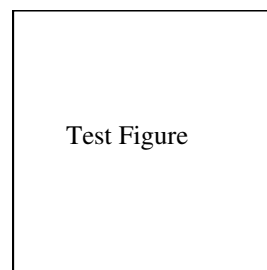


FIG. 1. A figure caption. The figure captions are automatically numbered.

## Wide Test Figure

FIG. 2. Use the `figure*` environment to get a wide figure that spans the page in `twocolumn` formatting.TABLE II. This is a wide table that spans the full page width in a two-column layout. It is formatted using the `table*` environment. It also demonstrates the use of `\multicolumn` in rows with entries that span more than one column.

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

<sup>a</sup> The  $z$  parameter of these positions is  $z \sim \frac{1}{4}$ .

which shows a figure that is small enough to fit in a single column.

In exceptional cases, you will need to move the float earlier in the document, as was done with Table II: L<sup>A</sup>T<sub>E</sub>X’s float placement algorithms need to know about a full-page-width float earlier.

Fig. 2 has content that is too wide for a single column, so the `figure*` environment has been used.

The content of a table is typically a `tabular` environment, giving rows of type in aligned columns. Column entries separated by `&`’s, and each row ends with `\\`. The required argument for the `tabular` environment specifies how data are aligned in the columns. For instance, entries may be centered, left-justified, right-justified, aligned on a decimal point. Extra column-spacing may be specified as well, although REV<sub>T</sub>E<sub>X</sub> 4 sets this spacing so that the columns fill the width of the table. Horizontal rules are typeset using the `\hline` command. The doubled (or Scotch) rules that appear at the top and bottom of a table can be achieved enclosing the `tabular` environment within a `ruledtabular` environment. Rows whose

TABLE III. Numbers in columns Three–Five are aligned with the “d” column specifier (requires the `dcolumn` package). Non-numeric entries (those entries without a “.”) in a “d” column are aligned on the decimal point. Use the “D” specifier for more complex layouts.

One	Two	Three	Four	Five
one	two	three	four	five
He	2	2.77234	45672.	0.69
C <sup>a</sup>	C <sup>b</sup>	12537.64	37.66345	86.37

<sup>a</sup> Some tables require footnotes.

<sup>b</sup> Some tables need more than one footnote.

columns span multiple columns can be typeset using the `\multicolumn{#1}{#2}{#3}` command (for example, see the first row of Table II).

Tables I, II, III, and IV show various effects. A table that fits in a single column employs the `table` environment. Table II is a wide table, set with the `table*` environment. Long tables may need to break across pages. The most straightforward way to accomplish this is to specify the [H] float placement on the `table` or `table*` environment. However, the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> package `longtable` allows headers and footers to be specified for each page of the table. A simple example of the use of `longtable` can

TABLE IV. A table with numerous columns that still fits into a single column. Here, several entries share the same footnote. Inspect the L<sup>A</sup>T<sub>E</sub>X input for this table to see exactly how it is done.

	$r_c$ (Å)	$r_0$ (Å)	$\kappa r_0$		$r_c$ (Å)	$r_0$ (Å)	$\kappa r_0$
Cu	0.800	14.10	2.550	Sn <sup>a</sup>	0.680	1.870	3.700
Ag	0.990	15.90	2.710	Pb <sup>b</sup>	0.450	1.930	3.760
Au	1.150	15.90	2.710	Ca <sup>c</sup>	0.750	2.170	3.560
Mg	0.490	17.60	3.200	Si <sup>d</sup>	0.900	2.370	3.720
Zn	0.300	15.20	2.970	Li <sup>b</sup>	0.380	1.730	2.830
Cd	0.530	17.10	3.160	Na <sup>e</sup>	0.760	2.110	3.120
Hg	0.550	17.80	3.220	K <sup>e</sup>	1.120	2.620	3.480
Al	0.230	15.80	3.240	Rb <sup>c</sup>	1.330	2.800	3.590
Ga	0.310	16.70	3.330	Cs <sup>d</sup>	1.420	3.030	3.740
In	0.460	18.40	3.500	Ba <sup>e</sup>	0.960	2.460	3.780
Tl	0.480	18.90	3.550				

<sup>a</sup> Here’s the first, from Ref. ? .

<sup>b</sup> Here’s the second.

<sup>c</sup> Here’s the third.

<sup>d</sup> Here’s the fourth.

<sup>e</sup> And etc.

be found in the file `summary.tex` that is included with the REVTeX 4 distribution.

There are two methods for setting footnotes within a table (these footnotes will be displayed directly below the table rather than at the bottom of the page or in the bibliography). The easiest and preferred method is just to use the `\footnote{#1}` command. This will automatically enumerate the footnotes with lowercase roman letters. However, it is sometimes necessary to have multiple entries in the table share the same footnote. In this case, there is no choice but to manually create the footnotes using `\footnotemark[#1]` and `\footnotetext[#1]{#2}`. `#1` is a numeric value. Each time the same value for `#1`

is used, the same mark is produced in the table. The `\footnotetext[#1]{#2}` commands are placed after the `tabular` environment. Examine the L<sup>A</sup>T<sub>E</sub>X source and output for Tables I and IV for examples.

*Physical Review* style requires that the initial citation of figures or tables be in numerical order in text, so don't cite Fig. 2 until Fig. 1 has been cited.

## ACKNOWLEDGMENTS

We wish to acknowledge the support of the author community in using REVTeX, offering suggestions and encouragement, testing new versions,...

- 
- [1] ReVTeX 4 Home Page at the American Physical Society, <https://authors.aps.org/revtex4/>.
  - [2] The Comprehensive T<sub>E</sub>X Archive Network, <http://tug.ctan.org/tex-archive/help/Catalogue/catalogue.html>
  - [3] Ferd Berwick, *Capacitive Energy Storage*, First edition, Foobar Press, 1964. ISBN 0-123-456789-1.
  - [4] AAST<sub>E</sub>X 52 page at <http://aastex.aas.org/>
  - [5] Jeff Wragg, *My Life in China*, p. 27, Shanghai Press, 2014

## Appendix A: Appendices

The `\appendix` command signals that all following sections are appendices, so `\section{title text}` after `\appendix` will set `{title text}` as an appendix

heading (an empty `{title text}` is permitted). For a single appendix, use a `\appendix*` followed by `\section{title text}` command to suppress the appendix letter in the section heading.

## Appendix B: Statistical Methods

What statistical things did you do? What was calculated? How?

## Appendix C: Computational Tools

What tools did you use, and what did you use them for?