Manuscript Title:
with Forced Linebreak

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Abstract

An article usually includes an abstract, 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. Valid PACS numbers may be entered using the `\pacs{#1}` command.

PACS numbers: Valid PACS appear here

I. FIRST-LEVEL HEADING:
THE LINE BREAK WAS FORCED via \\

This sample document demonstrates proper use of JASATeX (and LaTeX 2_ε) in mansucripts prepared for submission to the Journal of the Acoustical Society of America. Further information can be found in the documentation included in the distribution or available at ⟨`tobedetermined`⟩.

When commands are referred to in this example file, they are always shown with their required arguments, using normal TeX format. In this format, `#1`, `#2`, etc. stand for required author-supplied arguments to commands. For example, in `\section{#1}` the `#1` stands for the title text of the author's section heading, and in `\title{#1}` the `#1` stands for the title text of the paper.

Line breaks in section headings at all levels can be introduced using \\. A blank input line tells TeX that the paragraph has ended. Note that top-level section headings are automatically uppercased. If a specific letter or word should appear in lowercase instead, you must escape it using `\lowercase{#1}` as in the word "via" above.

A. Second-level heading: Formatting

This file may be formatted using either the `preprint` or `nopreprint` document class options; the former is the default. The `preprint` option has the format appropriate for journal submission, with large, doublespaced type, wide margins, figures and tables collected at the end, etc. The `nopreprint` option mimics the printed journal, with type at standard size and leading, laid out in two columns, and with figures and tables in place. This sample document is provided pre-formatted in each of the two formats.

It is essential that authors check that their manuscripts format acceptably under

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`preprint`. Manuscripts submitted that do not may be delayed in both the editorial and production processes.

1. Third-level heading: References and footnotes

Reference citations in text use the commands `\cite{#1}` or `\onlinecite{#1}`. The `#1` argument may contain letters and numbers.

You may choose citations in the author-year format or numerical format; the latter is the default. For the former, use the `author-year` document class option; for the latter, use the `numerical` document class option. This sample document is provided pre-formatted in each of the two styles.

The reference itself is specified by a `\bibitem{#1}` command with the same argument as the `\cite{#1}` command. `\bibitem{#1}` commands may be crafted by hand or, preferably, aautomatically generated by using BibTeX. JASATeX includes BibTeX style files `jasanum.bst` and `jasaauthyear.bst` appropriate for *Journal of the Acoustical Society of America*.

This sample file demonstrates the basic use of BibTeX through the use of the `\bibliography` command which references the `assamp.bib` file. Running BibTeX (typically `bibtex jasasamp`) after the first pass of LaTeX produces the file `jasasamp.bbl` which contains the automatically formatted `\bibitem` commands (including extra markup information via `\bibinfo` commands). If not using BibTeX, the `thebibliography` environment should be used instead.

a. Run-in heading: Bibliographic citations To cite bibliography entries, use the `\cite{#1}` command. JASATeX will display the corresponding number(s) in square brackets:[1,2]. To avoid the square brackets, use `\onlinecite{#1}`: Refs.1 and2. The document class "collapses" lists of consecutive reference numbers where possible. We now cite everyone together[1–3], and once again (Refs.1–3). Note that the references were also sorted into the correct numerical order as well.

Footnotes are marked up using the `\footnote{#1}` command.[4] If using numeric references, the footnotes are formatted in the same sequence as the citations.

II. MATH AND EQUATIONS

Inline math may be typeset using the `$` delimiters. Bold math symbols may be achieved using the `bm` package and the `\bm{#1}` command it supplies. For instance, a bold α can be typeset as `$\bm{\alpha}$` giving $\boldsymbol{\alpha}$. 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; 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.

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

$$\left\{ 1234567890abc123\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2} \right\}. \tag{2}$$

Note the open one in Eq. (2).

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:

$$\left\{ ab12345678abc123456abcdef\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2} \right\}. \tag{3}$$

When the `\label{#1}` command is used [cf. input for Eq. (2)], 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:

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

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:

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

$$
\sum |M_g^{\text{viol}}|^2 = g_S^{2n-4}(Q^2) \; N^{n-2}(N^2 - 1)
$$
$$
\times \left(\sum_{i<j} \right) \sum_{\text{perm}} \frac{1}{S_{12}} \frac{1}{S_{12}} \sum_{\tau} c_\tau^f \;. \tag{5}
$$

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 of `\text{#1}` for roman characters in 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, the equation number $(2.6')$:

$$
g^+ g^+ \to g^+ g^+ g^+ g^+ \ldots \;, \quad q^+ q^+ \to q^+ g^+ g^+ \ldots \;. \tag{2.6'}
$$

A few notes on `\tag{#1}`. `\tag{#1}` requires `amsmath`. The `\tag{#1}` must come before any `\label{#1}`. The numbering set with `\tag{#1}` is *transparent* to the automatic numbering in JASATeX; 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 for exceptional cases. Do not use it to number all equations in a paper.

Enclosing single-line and multiline equations in `\begin{subequations}` and `\end{subequations}` will produce a set of equations that are "numbered" with letters, as shown in Eqs. (6a) and (6b) below:

$$\left\{ abc123456abcdef\alpha\beta\gamma\delta1234556\alpha\beta\frac{1\sum_b^a}{A^2} \right\}, \tag{6a}$$

$$\mathcal{M} = ig_Z^2(4E_1E_2)^{1/2}(l_i^2)^{-1}(g_{\sigma_2}^e)^2\chi_{-\sigma_2}(p_2)$$
$$\times[\epsilon_i]_{\sigma_1}\chi_{\sigma_1}(p_1). \tag{6b}$$

Putting a `\label{#1}` command right after the `\begin{subequations}`, allows one to reference all the equations in a subequations environment. For example, the equations in the preceding subequations environment were Eqs. (6).

1. Wide equations

The equation that follows is set in a wide format, i.e., it spans across the full page. The wide format is reserved for long equations that cannot be easily broken into four lines or less:

$$\mathcal{R}^{(d)} = g_{\sigma_2}^e \left(\frac{[\Gamma^Z(3,21)]_{\sigma_1}}{Q_{12}^2 - M_W^2} + \frac{[\Gamma^Z(13,2)]_{\sigma_1}}{Q_{13}^2 - M_W^2} \right) + x_W Q_e \left(\frac{[\Gamma^\gamma(3,21)]_{\sigma_1}}{Q_{12}^2 - M_W^2} + \frac{[\Gamma^\gamma(13,2)]_{\sigma_1}}{Q_{13}^2 - M_W^2} \right). \tag{7}$$

This is typed to show the output is in wide format. (Since there is no input line between `\equation` and this paragraph, there is no paragraph indent for this paragraph.)

III. CROSS-REFERENCING

JASATEX will automatically number sections, equations, figure captions, and tables. Mark an item with the `\label{#1}` command and refer to it with the `\ref{#1}` command. For the associated page number, use the `\pageref{#1}` command.

The `\label{#1}` command should appear in a section heading, within an equation, or in a table or figure caption. The `\ref{#1}` command is used in the text where the citation is to be displayed. Some examples: Section I on page 3, Table I, and Fig. 1.
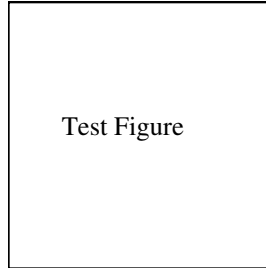
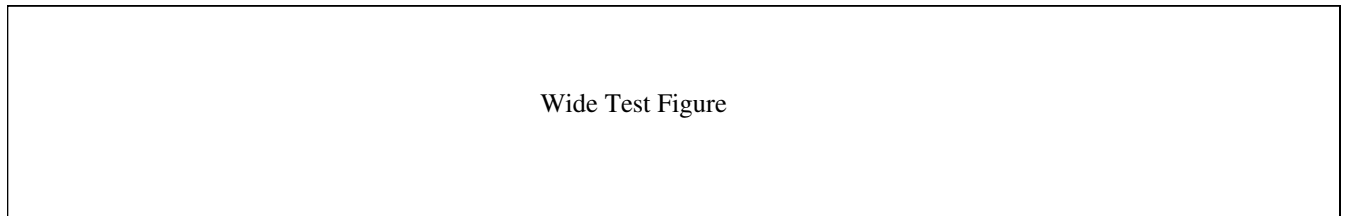FIG. 1. A figure caption. The figure captions are automatically numbered.

FIG. 2. Use the figure* environment to get a wide figure that spans the page in a two-column layout.

IV. FIGURES AND TABLES

Figures and tables are typically "floats" which means that their final position is determined by LaTeX while the document is being typeset. LaTeX isn't always successful in placing floats optimally.

Figures may be inserted by using either the `graphics` or `graphix` packages. These packages both define the `\includegraphics{#1}` command, but they differ in the optional arguments for specifying the orientation, scaling, and translation of the figure. Fig. 1 shows a figure that is small enough to fit in a single column. It is embedded using the `figure` environment, which both provides the caption and imports the figure file.

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

The heart of any table is the `tabular` environment which gives the rows of the tables. Each row consists of column entries separated by `&`'s and terminated with `\\`. The required argument for the `tabular` environment specifies how data are displayed in the columns. For

instance, entries may be centered, left-justified, right-justified, or aligned on a decimal point. Extra column spacing may be be specified as well, although JASATeX 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 by enclosing the `tabular` environment within a `ruledtabular` environment. Rows whose columns span multiple columns can be typeset using the `\multicolumn{#1}{#2}{#3}` command (for example, see the first row of Table III).

Tables I–IV show various effects. Tables that fit in a narrow column are contained in a `table` environment. Table III 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 standard LaTeX 2_ε package `longtable` gives more control over how tables break and allows headers and footers to be specified for each page of the table. A simple example of the use of `longtable` can be found in the file `summary.tex` included with the JASATeX 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 preferred method is 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, you must 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 LaTeX source and output for Tables I and II for examples.

Conventional 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 JASATEX, offering suggestions and encouragement, and testing new versions.

APPENDIX A: APPENDIXES

To start the appendixes, use the `\appendix` command. This signals that all following section commands refer to appendixes instead of regular sections. Therefore, the `\appendix` command should be used only once—to switch the section commands to act as appendixes. Thereafter normal section commands are used. The heading for a section can be left empty. For example,

```
\appendix
\section{}
```

will produce an appendix heading that says "APPENDIX A" and

```
\appendix
\section{Background}
```

will produce an appendix heading that says "APPENDIX A: BACKGROUND" (note that the colon is set automatically).

If there is only one appendix, then the letter "A" should not appear. Suppress it by using the *-form of the appendix command (`\appendix*` in the place of `\appendix`).

APPENDIX B: A LITTLE MORE ON APPENDIXES

Observe that this appendix was started by using

```
\section{A little more on appendixes}
```

Note the equation number in an appendix:

$$E = mc^2.$$

(B1)

1. A subsection in an appendix

You can use a \subsection or \subsubsection in an appendix. Note the numbering: we are now in Appendix B.1.

Note the equation numbers in this appendix, produced with the subequations environment:

$$E = mc, \tag{B2a}$$

$$E = mc^2, \tag{B2b}$$

$$E > mc^3. \tag{B2c}$$

They turn out to be Eqs. (B2a), (B2b), and (B2c).

REFERENCES

[1] R. P. Feynman, "Positrons are electrons traveling backwards in time", Phys. Rev. **94**, 262 (1954).

[2] E. Witten, "Duality in string theory gives rise to quantum gravity", .

[3] A. Einstein, B. Podolsky, and N. Rosen, "A conjecture to end all", Phys. Rev. **47**, 777 (1935).

[4] Here is a sample footnote.

TABLE I. This is a narrow table which fits into a narrow column when using a two-column layout. Note that JASATEX adjusts the intercolumn spacing so that the table fills the entire width of the column. Table captions are numbered automatically. This table illustrates left-aligned, centered, and right-aligned columns.

Left[a]	Centered[b]	Right
1	2	3
10	20	30
100	200	300

[a]Note a.

[b]Note b.

TABLE II. A table with more columns still fits properly in a column. Note that several entries share the same footnote. Inspect the LaTeX input for this table to see exactly how it is done.

	r_c (Å)	r_0 (Å)	κr_0		r_c (Å)	r_0 (Å)	κr_0
Cu	0.800	14.10	2.550	Sn[a]	0.680	1.870	3.700
Ag	0.990	15.90	2.710	Pb[b]	0.450	1.930	3.760
Au	1.150	15.90	2.710	Ca[c]	0.750	2.170	3.560
Mg	0.490	17.60	3.200	Sr[d]	0.900	2.370	3.720
Zn	0.300	15.20	2.970	Li[b]	0.380	1.730	2.830
Cd	0.530	17.10	3.160	Na[e]	0.760	2.110	3.120
Hg	0.550	17.80	3.220	K[e]	1.120	2.620	3.480
Al	0.230	15.80	3.240	Rb[c]	1.330	2.800	3.590
Ga	0.310	16.70	3.330	Cs[d]	1.420	3.030	3.740
In	0.460	18.40	3.500	Ba[e]	0.960	2.460	3.780
Tl	0.480	18.90	3.550				

[a]Here's the first, from Ref.1.

[b]Here's the second.

TABLE III. This is a wide table that spans the page width in a two-column layout. It is formatted using the `table*` environment. It also demonstates 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		$(4k)^a$		$(4h)^a$

[a]The z parameter of these positions is $z \sim \frac{1}{4}$.

TABLE IV. Numbers in columns Three–Five have been aligned using the "d" column specifier (requires the `dcolumn` package). Non-numeric entries (those entries without a ".") in a "d" column are centered. 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[a]	C[b]	12537.64	37.66345	86.37

[a]Some tables require footnotes.
[b]Some tables need more than one footnote.

LIST OF FIGURES