

# Preparing contributions to CERN reports (school, workshop, and conference proceedings)

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## Abstract

This document explains instructions for authors who want to prepare electronic copy to be published as a CERN Report.

## 1 Introduction

Authors must observe the following instructions to ensure consistency and uniformity in the style and layout of CERN Reports. Wherever possible, each contribution will go directly to be printed, without any editing, and should therefore be in its final form.

Although the typesetting rules that are described are of a general nature, the present document emphasizes their use with  $\text{\LaTeX}$ . Templates and more detailed information for *Word* users are available on the DTP Web site (*Word* Section at the page <http://cern.ch/DTP/dtpcernreport.htm>).

Note that it is the author's responsibility to obtain permission from the copyright holder if material taken from other sources is included in the source submitted as a CERN Report.

## 2 Generalities on typing

When submitting your electronic source in  $\text{\LaTeX}$ , you must use the `cernrep` class file, which is available from the DTP Web site (<http://cern.ch/DTP>). Moreover, specific instructions for preparing your  $\text{\LaTeX}$  contribution are given in the appendices.

### 2.1 Format for the text

Take care that your material stays inside the text frame which is 16 cm  $\times$  24 cm (i.e., a A4 sized paper has 3.0 cm margins at the top and at the bottom, and 2.5 cm left and right). This is especially true for figures and tabular content.

## 3 Parts of the text

### 3.1 Abstract

Your contribution should be preceded by an abstract of not more than 150 words, written as a single paragraph.

### 3.2 Sectioning commands and paragraphs

The standard  $\text{\LaTeX}$  commands `\section` (level 1), `\subsection` (level 2), `\subsubsection` (level 3), `\subsubsubsection` (level 4), should be used for headings. Do not start a new section on a new page, but continue on the same page.

In the text, leave a blank line after each paragraph.

### 3.3 Equations

Equations should be treated as part of the text, and therefore punctuated (with a space between the end of the equation and the punctuation mark). Equations are numbered consecutively throughout the report.

An unnumbered single formula is delimited by `\[` and `\]` (alternatively a `displaymath` environment can be used), while a numbered equation is generated with the `equation` environment. You should **never** use the `$$` construct. The CERN L<sup>A</sup>T<sub>E</sub>X classes automatically load the `amsmath` class, which offers a large choice of constructs for typesetting mathematics [1]. See also Appendix B.2 for some hints about using the `amsmath` extensions in an optimal way.

For cross-referencing equations use the L<sup>A</sup>T<sub>E</sub>X commands `\label` and `\ref`, as explained in Section 3.8. A simple example, with a cross-reference to a formula, follows.

```
\section{Section title}
\label{sec:mysection}
Einstein has expressed the relation between energy  $E$ 
and mass  $m$  in his famous equation~(\ref{eq:einstein}):
\begin{equation}
E=mc^2 \label{eq:einstein}
\end{equation}
```

### 3.4 Figures

#### 3.4.1 How to supply figures

Where possible, figures should be prepared electronically. Make sure that the image is of high quality when printed (in black and white) and is of high enough resolution (min. 300 dots per inch). We accept PICT, TIFF, PNG, and JPEG files. Encapsulated PostScript (EPS) files are preferred, but in any case, send us your illustrations in their *original* format (PNG, JPEG, etc.), there is no need for you to reprocess them yourself.

If you cannot provide electronic copies, or if we consider that your files do not print out well, you should provide a good-quality paper original. In this case we will arrange for it to be scanned at CERN and included in the report.

Do not use free-hand lettering for the labelling of figures. All lines should be drawn in red or black ink and be heavy enough (min. 0.75 point) and all figures, decimal points, symbols, etc., large enough and sufficiently spaced to ensure clarity when printed *at the final size*. If using colour, please ensure that the figure prints clearly in greyscale and adapt your text knowing that the difference between coloured items when reproduced in grey is not obvious.

As already mentioned, before using material such as illustrations taken from other sources, do not forget to obtain permission from the copyright holder.

#### 3.4.2 Positioning and layout

All figures must remain within the page area (16 cm × 24 cm), where, if necessary, the page may be turned 90° to accommodate the figure. When this is done, the caption must be oriented in the same way as the figure, and no other text may appear on that page. The bottom of the turned illustrations should be at the right-hand side of the page.

#### 3.4.3 Including your figure

Figures are included with the `figure` environment. In the example that follows we include an EPS graphics file (`myfig.eps`, where the extension `.eps` does not need to be specified since it is the default) with the `\includegraphics` command, which is defined in the `graphicx` package that is loaded by default by the CERN L<sup>A</sup>T<sub>E</sub>X classes.

The figure caption (specified as argument of the `\caption` command), must *follow* the figure body, and should be brief. No full stop is necessary unless the caption is more than one sentence long, in which case full punctuation should be used.

### 3.4.3.1 Example

An example with a cross-reference to a figure follows. The reference is defined by the `\label` command *following* the `\caption` command. A cross-reference is generated with the `\ref` command on the second line. Note the cross-reference key (`fig:myfig`) which clearly indicates that it refers to a figure (see Section 3.8 for a discussion of the importance of using good keys).

```
\section{Section title}
In Fig.~\ref{fig:myfig} we see that ...
\begin{figure}
\centering\includegraphics[width=.9\linewidth]{myfig}
\caption{Description of my figure}
\label{fig:myfig}
\end{figure}
```

### 3.4.4 References to figures

L<sup>A</sup>T<sub>E</sub>X's cross-reference mechanism can be used to refer to figures. A figure is defined with the `\label` command, which must *follow* the `\caption` command.

Figures must be referenced in the text in consecutive numerical order with the help of the `\ref` command. Examples of references to figures and how to produce them follow (see also Table A.1).

- ‘Fig. 3’ produced by, e.g., `\Fref{fig:myfig}`,
- ‘Figs. 3–5’ produced by, e.g., `\Figures~\ref{fig:myfiga}--\ref{fig:myfigb}`,
- ‘Figure 3’, produced by, e.g., `\Figure[b]~\ref{fig:myfig}`. Note the use of the optional argument [b], which indicates that the word ‘Figure’ should be typeset in full, in particular at the beginning of a sentence.

Figures with several parts are cited as follows: ‘Fig. 2(a) and (b), Figs. 3(a)–(c)’.

Figures and illustrations *should follow* the paragraph in which they are first discussed. If this is not feasible, they may be placed on the following page (L<sup>A</sup>T<sub>E</sub>X's float mechanism takes care of this automatically, in principle). If it is not possible to place *all* numbered figures in the text, then they should *all* be placed at the end of the paper.

## 3.5 Tables

Tables are defined the the `table` environment. Each table should be centred on the page width, with a brief caption (specified as argument of the `\caption` command) *preceding* the table body.

In general, tables should be open, drawn with a double thin horizontal line (0.4 pt) at the top and bottom, and single horizontal line (0.4 pt) separating column headings from data.

Like figures, tables must be referenced in the text in consecutive numerical order with L<sup>A</sup>T<sub>E</sub>X's `\ref` command. Examples of cross-references to tables follow (commands that can be used to generate the given text strings are shown between parentheses): ‘Table 5’ (e.g., `\Tref{tab:mytab}` or `\Table~\ref{tab:mytab}`), ‘Tables 2–3’ (e.g., `\Tables~\ref{tab:mytaba}--\ref{tab:mytabb}`). The word ‘Table’ should never be abbreviated.

### 3.5.1 Formatting and layout within the table

Write the headings in sentence case but do not use full stops. Units should be entered in parentheses on a separate line below the column heading. (If the same unit is used throughout the table, it should be written in parentheses on a separate line below the caption.)

Unsimilar items should be aligned on the left, whereas similar items should be aligned on the operator or decimal point. All decimal points must be preceded by a digit.

### 3.5.1.1 Table captions

Table captions should be brief and placed centrally *above* the table. No full stop is necessary unless the caption is more than one sentence long, in which case full punctuation should be used.

### 3.5.1.2 Notes in the table

Notes in tables should be designated by superscript lower-case letters, and begun anew for each table. The superscript letter should be placed in alphabetical order moving from left to right across the first row and down to the last. The notes should then be listed directly under the table.

References cited in tables should appear in consecutive numerical order, following the order explained above for notes (left to right, top to bottom). They should appear exactly as references cited in the main body of the document (and be treated as part of the text in terms of numbering, so be careful when moving tables containing references).

### 3.5.1.3 Example

An instance of a simple table, following the proposed rules follows. Notice the `\hline` commands at the beginning and end of the tabular environment to generate the double lines at the top and the bottom of the table, as well as the single `\hline` command to separate the heading from the data.

```
\section{Section title}
Table~\ref{tab:famous} shows three famous mathematical constants.
\begin{table}
\caption{Famous constants}
\label{tab:famous}
\centering
\begin{tabular}{lll}\hline\hline
symbol & description & & approximate value\\\hline
 $e$  & base of natural logarithm & & 2.7182818285 \\
 $\pi$  & ratio circle circumference to diameter & & 3.1415926536 \\
 $\phi$  & golden ratio & & 1.6180339887\\\hline\hline
\end{tabular}
\end{table}
```

## 3.6 Bibliographical references

References should be cited in the text using numbers within square brackets: ‘example [1], example [1, 2], example [1–5]’. This is achieved with the `\cite` command. One can also write ‘see Ref. [1]’, ‘Refs. [1]–[5]’, and, at the beginning of a sentence, ‘Reference [2]’. These strings can be produced as follows (see also Table A.1).

- `\Bref{bib:mybiba}` or `\Ref~\cite{bib:mybiba}` typeset, e.g., ‘Ref. [1]’.
- `\Refs~\cite{bib:mybiba}--\cite{tab:mybibb}`, typesets, e.g., ‘Refs [1–5]’.
- `\Bref[b]~\ref{bib:mybibc}` typesets, e.g., ‘Reference [3]’. The optional argument [b] indicates that the word ‘Reference’ should be typeset in full, in particular at the beginning of a sentence.

Bibliographical references should appear in consecutive numerical order and should be listed in numerical order at the end of the text. Punctuation can be used either within or outside the brackets, but please ensure one method is used consistently throughout the contribution.

### 3.6.1 List of references

The list of references (the `\bibitem` entries) must all be grouped inside a `thebibliography` environment, as follows.

```
\section{Section title}
Work by Einstein~\cite{bib:einstein} as well as \Bref{bib:gravitation}
explains the theory of relativity.
...
\begin{thebibliography}
\bibitem{bib:einstein}} ...
\bibitem{bib:gravitation} ...
...
\end{thebibliography}
```

As shown, each `\bibitem` is identified with a reference key (`bib:einstein`, `bib:gravitation`, etc.), which allows one to refer to the relevant bibliography entry with a `\cite{bib:einstein}` command in the text. The information about each entry can be specified in a separate file, e.g., `mybib.bbl`, which can be read by the `BIBTEX` program for generating the list of references (see a `LATEX` manual or Chapter 12 of Ref. [2] for details).

Unless you are near the bottom of the last page of text, do *not* start a new page for the list of references, but continue on the same page. Note that in the list of references it is unnecessary to state the title of an article or chapter in proceedings or in a collection of papers unless a page number cannot be quoted, e.g., for forthcoming publications.

For abbreviations of names of journals quoted in the references, see the *Journal abbreviations* entry available from the Web page at the URL <http://cern.ch/DTP/dtpgrammar.htm><sup>1</sup>. The entry *Citation of references* on the same Web page shows more details on how to present references.

If you need to provide a bibliography, this should come after the list of references.

### 3.7 Footnotes

Footnotes are to be avoided. If absolutely necessary, they should be brief, and placed at the bottom of the page on which they are referred to. Take care when citing references in the footnotes to ensure that these are correctly numbered.

### 3.8 Referencing structural elements

In this section we give a general overview of `LATEX`'s reference mechanism which makes it easy to reference structural elements. First a `\label` command, with a unique *key* as its argument to identify the structural element in question, must be placed in the source, as follows.

- For sectioning commands, such as `\section`, `\subsection`, `\subsubsection`, the `\label` command must *follow* it.
- Inside `figure` and `table` environments, the `\label` command must be placed *after* the `\caption` command.
- Inside an equation environment the `\label` command can be placed anywhere.
- Inside an `eqnarray` environment, the `\label` command can be used to identify each line, so that it must be placed *before* each end-of-line `\\`. If for a given line no line-number has to be produced, a `\nonumber` command should be used.
- Inside an `enumerate` environment a `\label` command can be associated with each `\item` command.

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<sup>1</sup>of Modern Physics site: <http://rmp.aps.org/info/manprep.html> also has a list.

- Inside a footnote a `\label` command can be placed anywhere.

As seen in all the examples in this document, for reasons of clarity it is best to place the `\label` command immediately *following* the element it refers to (rather than inserting it inside its contents).

From any place in the document one can refer to a structural element identified with a `\label` command with the help of a `\ref` command. An example follows.

```
\section{My first section}\label{sec:first}
Figure~\ref{fig:fdesc} in Section~\ref{sec:second} shows \dots
\begin{table}
\caption{table caption text}\label{tab:tdesc}
...
\end{table}
\begin{equation}
\exp{i\pi}+1=0\label{eq:euler}
\end{equation}
\section{My second section}\label{sec:second}
In Section~\ref{sec:first} contains Table~\ref{tab:tdesc} and
Eq.~\ref{eq:euler}
\begin{figure}
\centering\includegraphics[...]{...}
caption{Text of figure caption}
\label{fig:fdesc}
\end{figure}
```

To easily differentiate between references to the various structural elements it is good practice to start the key with a few characters identifying it (e.g., `sec:` for a sectioning command, such as `\section`, `\subsection`, etc., `fig:` for figures, `tab:` for tables, and `eq:` for equations, including `eqnarray` environments (which should have a `\label` command placed before the `\\` if you want to identify the line in question). The second part of the key should identify the particular element clearly, e.g., use of a mnemonic component, such as `eq:euler` in the example of the equation reference above. Avoid using keys with only digits, such as `f1`, `f2`, etc., since, if for any reason structural elements are eliminated or change position in the source, confusion can result.

### 3.9 Appendices

Each appendix should be laid out as the sections in the text. Appendices should be labelled alphabetically and be referred to as Appendix A, Appendices A–C, etc. Equations, figures and tables should be quoted as Eq. (A.1) and Fig. A.1, etc.

### 3.10 Acknowledgements

If required, acknowledgements should appear as an unnumbered subsection immediately before the references section.

## 4 Spelling and grammar

For more information on English grammar rules and commonly misused words and expressions (including a guide to avoiding ‘franglais’), please see the files available from the DTP Web pages.

### 4.1 Spelling

CERN uses British English spelling, and ‘-ize’ rather than ‘-ise’. Here we provide a few examples for guidance:

-il: fulfil (not fulfill)  
 -re: centre (not center)  
 -our: colour (not color)  
 -gue: catalogue (not catalog, but analog is used in electronics)  
 -mme: programme (not program, unless referring to a computer program)  
 -ell-: labelled (not labeled)  
 -ce/-se: licence (noun), license (verb), practice (noun), practise (verb)  
 -ize: organization, authorize.  
 Exceptions to this rule include advise, comprise, compromise, concise, demise, devise, enterprise, exercise, improvise, incise, precise, revise, supervise, surmise, surprise, televise.

## 4.2 Punctuation

### 4.2.1 Hyphen

Hyphens are used to avoid ambiguity, i.e., in attributive compound adjectives (compare ‘a little used car’ and ‘a little-used car’), to distinguish between words such as ‘reform’ (change for the better) and ‘re-form’ (form again), and to separate double letters to aid comprehension and pronunciation (e.g., co-operate).

Hyphens are also used if a prefix or suffix is added to a proper noun, symbol, or numeral, and in fractions: e.g., non-Fermi, 12-fold, three-quarters.

### 4.2.2 En dash

En dashes are used to mean ‘and’ (e.g., space–time, Sourian–Lagrange) or ‘to’ (e.g., 2003–2004, input–output ratio).

### 4.2.3 Em dash

An em dash is used as a parenthetical pause. Simply type with no space on either side (*Word* will automatically insert a thin space), e.g., ‘the experiment—due to begin in 2007—represents a major advance...’. In  $\text{\LaTeX}$  you can use `--` and `---` for entering an en dash, and an em dash, respectively.

### 4.2.4 Quotation marks

Double for true quotations, single for anything else. Single within double for a quotation within a quotation. Our preferred method of punctuation around quotation marks is to place punctuation marks outside the quotation marks, to avoid any ambiguity: Oxford has been called a ‘Home of lost causes’.

### 4.2.5 Apostrophe

Do not use in plural acronyms (e.g., JFETs), decades (1990s). Do use in plural Greek letters and symbols (e.g.,  $\pi$ ’s).

### 4.2.6 Colon, semi-colon, exclamation mark, question mark

Please note that in English these punctuation marks do not require a space before them.

## 4.3 Lists

In a series of three or more terms, use a comma (sometimes called the serial comma) before the final ‘and’ or ‘or’ (e.g., gold, silver, or copper coating). In a run-on list, do not introduce a punctuation mark between the main verb and the rest of the sentence. Avoid the use of bullet points.

For a displayed list there are two options:

- i) finish the introductory sentence with a colon, start the first item of the list with a lower-case letter, finish it with a semi-colon, and do the same for all items until the last, where a full stop is placed at the end of the text (as here);
- ii) finish the introductory sentence with a full stop, start the first item with a capital letter and finish it with a full stop, and the same for the remaining items.

## 4.4 Capitalization

Capitalize adjectives and nouns formed from proper names, e.g., Gaussian. Exceptions to this rule include units of measure (amperes), particles (fermion), elements (einsteinium), and minerals (fosterite) derived from names. Capitalize only the name in Avogadro's number, Debye temperature, Ohm's law, Bohr radius.

Never capitalize lower-case symbols or abbreviations. When referring to article, paper, or report, column, sample, counter, curve, or type, do not capitalize.

Do capitalize Theorem I, Lemma 2, Corollary 3, etc.

### 4.4.1 Acronyms

In the first instance, spell out the acronym using capital letters for each letter used in the acronym, and provide the acronym in parentheses, e.g., Quark–Gluon Plasma (QGP).

## 4.5 Numbers

Spell out numbers 1 to 9 unless they are followed by a unit or are part of a series containing the number 10 or higher (as here); numbers are always in roman type. Numbers should always be written out at the beginning of a sentence.

## 4.6 Symbols

Names of particles, chemicals, waves or states, covariant couplings and monopoles, and mathematical abbreviations are written in roman type.

Symbols of variables (i.e., anything that can be replaced by a number) should be typed in *italics*.

Take care that this is consistent throughout the contribution.

## 4.7 Units

Symbols for units are printed in roman type. Symbols for units derived from proper names are written with capital letters (e.g., coulomb, 6 C). Write the unit out in full in cases such as 'a few centimetres'. When using symbols insert a *non-breaking space* between the number and the unit, unless it is % or superscript, e.g., 10~cm, 100~GeV, 15~nb, but 20%, 27\$^\circ\$C. To help you typeset units correctly, Table A.1 shows a set of predefined commands that are defined in the CERN L<sup>A</sup>T<sub>E</sub>X class files. For instance, the examples above could have been entered \Unit{10}{cm}, 100\UGeV, etc., where these commands work both in text or math mode. These \U... commands typeset a non-breaking space preceding the unit. Each of these commands have a partner ending in 'Z', which omits this space, e.g., 100~\UGeVZ. These variants can be useful when combining several units.

Please see the file on symbols and units, available from the DTP Web pages, for a list of abbreviations for the most commonly used units<sup>2</sup>.

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<sup>2</sup>NIST also has a useful summary on the subject, see <http://physics.nist.gov/cuu/Units/>.



## Appendices

### A The cernrep class file

The Web page at the URL <http://cern.ch/DTP/dtpcernreport.htm> contains a class file (`cernrep.cls`) that authors should download to prepare their contribution. There is also an example file (`cernrepexa.tex`), which can be used as a model. The  $\LaTeX$  source of the present document (`cernrep.tex`), as well as its typeset result (`cernrep.pdf`) are available as well.

#### A.1 Predefined commands

The CERN  $\LaTeX$  class files have predefined commands for often-occurring abbreviations of markup entities. Table A.1 gives a list. The unit commands provide the non-breaking space between the value and the unit's name.

**Table A.1:** Examples of predefined commands in the CERN  $\LaTeX$  classes

<i>Commands available in text mode</i>	<i>Result as printed</i>
<code>text \eg more text</code>	text e.g., more text
<code>text \etc, more text</code>	text etc., more text
<code>text \ie more text</code>	text i.e., more text
<i>Commands for cross-referencing (text mode)</i>	<i>Result as printed</i>
<code>\Eq[b]{\ref{eq:einstein}}</code> and <code>\Eref{eq:euler}</code>	Equation (1) and Eq. (2)
<code>\Figure[b]{\ref{fig:cern}}</code> and <code>\Fref{fig:fermi}</code>	Figure 3 and Fig. 4
<code>\Bref[b]{bib:top}</code> and <code>\Refs{\cite{bib:ref1,bib:ref2}}</code>	Reference [3] and Refs [6–7]
<code>\Sref{sec:intro}</code> and <code>\Sections{\ref{sec:sun}--\ref{sec:moon}}</code>	Section 1 and Sections 3.4–3.6
<code>\Tref{tab:sym}</code> and <code>\Tables{\ref{tab:top}--\ref{tab:charm}}</code>	Table 4 and Tables 5–6
<i>Commands available in math and text mode</i>	<i>Result as printed</i>
<i>Units</i>	
<code>\Unit{3}{Tm}</code> and <code>\$_\Unit{3}{Tm}\$</code>	3 Tm and 3 Tm
<code>\Unit{1}{PeV}</code> and <code>\$_\Unit{1}{PeV}\$</code>	1 PeV and 1 PeV
<code>3\UeV{}</code> and <code>\$_3\UeV\$</code>	3 eV and 3 eV
<code>3\UkeV{}</code> and <code>\$_3\UkeV\$</code>	3 keV and 3 keV
<code>3\UMeV{}</code> and <code>\$_3\UMeV\$</code>	3 MeV and 3 MeV
<code>3\UGeV{}</code> and <code>\$_3\UGeV\$</code>	3 GeV and 3 GeV
<code>3\UTeV{}</code> and <code>\$_3\UTeV\$</code>	3 TeV and 3 TeV
<code>3\UPeV{}</code> and <code>\$_3\UPeV\$</code>	3 PeV and 3 PeV
<code>3\UGeVcc{}</code> and <code>\$_3\UGeVcc\$</code>	3 GeV/c <sup>2</sup> and 3 GeV/c <sup>2</sup>

#### A.2 Obtaining the class file and making your contribution available

The `cernrep` class file loads a number of external packages, as well as some CERN-specific extensions. You need a recent  $\LaTeX$  setup (such as  $\TeX$ live 2004, see the TUG Web site <http://www.tug.org> for details) to fully exploit its possibilities.

In the CERN Linux environment these CERN-specific classes become available if you include the latest `texlive` in your `PATH` (see <http://xml.cern.ch/textproc/texliveunixcern.html>). For the convenience of off-site users a ZIP file `cernrep.zip` contains a set of files to supplement their (recent) setup.

Please contact the editors to determine the best way to submit your contribution. Please submit the  $\LaTeX$  file and separate files for each of the figures and the bibliography if using `bibtex` to generate the list of references. Figures or photographs that are not available in electronic form should be sent to the editors by post.

## B Things to do and not do when preparing your L<sup>A</sup>T<sub>E</sub>X contribution

Authors accumulate over time a certain experience and habits for preparing their scientific documents electronically using their preferred text editor and document processing system. When submitting a L<sup>A</sup>T<sub>E</sub>X source file to an editor for publication, it is very important that the source of the contribution be readable and understandable to the various people who have to intervene in the production process.

### B.1 Make your source easy to read and maintain

In order to make life easier for yourself as well as for the professionals who will have to deal with your source file, we invite authors to take into account the following general suggestions.

- Use, as far as possible, only basic L<sup>A</sup>T<sub>E</sub>X commands, including those of the packages that are loaded by the `cernrep.cls`. In particular, for graphics inclusion, use the `\includegraphics` command rather than its deprecated precursors (`\epsffile`, `\epsfig`, etc.). For math expressions, see Section B.2.
- Do not use T<sub>E</sub>X commands, but their L<sup>A</sup>T<sub>E</sub>X equivalents. In particular, `\def` should never be used to (re)define commands, since there exists `\newcommand`, or `\providecommand`, which will issue an error message if the command name is already in use. Basic L<sup>A</sup>T<sub>E</sub>X commands or environment should **never** be redefined.
- Do not use `$$` for delimiting a display math formula, but use the L<sup>A</sup>T<sub>E</sub>X construct `\[ ... \]`, instead. More generally, numbered equations can be produced with the `equation` environment, with `equation*` its unnumbered variant.
- Do not use one-letter (or even two-letter) lower-case commands as command definitions, since T<sub>E</sub>X, L<sup>A</sup>T<sub>E</sub>X, or some extension packages define these already. Indeed, many hours have been lost, to understand that the redefinition of, for instance, `\r` on one of the several thousands of lines of a L<sup>A</sup>T<sub>E</sub>X source of an author upset the typesetting several pages downstream. In general, it is good practice to define new commands starting with an upper-case letter and giving it a name with a mnemonic meaning, i.e., one which is three or more characters long.
- Do not replace L<sup>A</sup>T<sub>E</sub>X environments by commands, e.g., `\be`, `\ee`, and `\bee` and `\eee` for delimiting the `equation` and `eqnarray` environments, `\bi`, `\ei`, to delimit the `itemize` environment, etc. Saving a few keystrokes can be no excuse for obfuscating the source unnecessarily, thus making it more difficult to understand and maintain. Authors spend, in general, many weeks, preparing an article or a report. Hence it is certainly worth while to use, as far as possible, standard L<sup>A</sup>T<sub>E</sub>X commands, and to define new ones only to make the source *easier* to read and re-use.
- Do not use T<sub>E</sub>X's state changing font commands `\rm ...`, `\it ...`, `\bf ...`, etc., but use the L<sup>A</sup>T<sub>E</sub>X equivalents: in text mode `\textrm{...}`, `\textit{...}`, `\textbf{...}`, and inside math mode, `\mathrm{...}`, `\mathit{...}`, `\mathbf{...}`, etc.
- Do not reference equations, sectioning commands, figures, or tables by explicit, hard-coded numbers in your source, but use L<sup>A</sup>T<sub>E</sub>X's cross-reference mechanism, using a mnemonic key to identify each structural element clearly (see Section 3.8).
- Do not redefine L<sup>A</sup>T<sub>E</sub>X's basic counters, such as `equation`, `section`, etc. Numbering of such elements is defined by the `cernrep` class file and should not be modified by the authors, who should use only L<sup>A</sup>T<sub>E</sub>X's cross-reference mechanism to refer to equations, figures, tables, etc. (see Section 3.8).

### B.2 The amsmath extensions

Recent developments around L<sup>A</sup>T<sub>E</sub>X, often sponsored and driven by scientific publishers, have ensured that structural elements and math constructs in particular are easily delimited and their sense made clear.

The American Mathematical Society have done a great job with their `amsmath` extension, which is loaded by default in the `cernrep.cls` class. Therefore, we would like our authors to use the conventions and  $\LaTeX$  constructs of that package, rather than the pure  $\TeX$  primitives. This is all the more important as we want to take full advantage of the possibilities of hypertext and the Web, where  $\TeX$  primitives, because they are not clearly delimited, are much more difficult to handle (see previous paragraph).

Below we give a few often-occurring mathematics constructs, first in their  $\TeX$  form (to be avoided), their  $\LaTeX$  equivalent (to be preferred), and the typeset result.

- `\over` to be replaced by `\frac`.

**$\TeX$**  `\${Z^{\nu_{i}}\over 2 \Lambda_{\rm ext}}\$`

**$\LaTeX$**  `\${\frac{Z^{\nu_{i}}}{2 \Lambda_{\text{ext}}}}\$`

**Result** 
$$\frac{Z_i^\nu}{2\Lambda_{\text{ext}}}$$

- `\choose` to be replaced by `\binom`.

**$\TeX$**  `\${m + k \choose k}\$`

**$\LaTeX$**  `\${\binom{m + k}{k}}\$`

**Result** 
$$\binom{m+k}{k}$$

- `\matrix` family to be replaced by corresponding environments.

**$\TeX$**  `\${\matrix{a & b \cr c & d \cr}}\$`

**$\LaTeX$**  `\${\begin{matrix}a & b \\ c & d\end{matrix}}\$`

**Result** 
$$\begin{matrix} a & b \\ c & d \end{matrix}$$

**$\TeX$**  `\${\pmatrix{a & b \cr c & d \cr}}\$`

**$\LaTeX$**  `\${\begin{pmatrix}a & b \\ c & d\end{pmatrix}}\$`

**Result** 
$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$$

**$\TeX$**  `\${\bmatrix{a & b \cr c & d \cr}}\$`

**$\LaTeX$**  `\${\begin{bmatrix}a & b \\ c & d\end{bmatrix}}\$`

**Result** 
$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

- Cases construct: use the `cases` environment.

**$\LaTeX$  without `amsmath`** `$$`

```
{\rm curvature~} R = {6K\over a^2(t)} \quad
\left\{\begin{array}{ll}
K=-1\quad&\{\rm open\}\backslash\backslash
K=0\quad&\{\rm flat\}\backslash\backslash
K=+1\quad&\{\rm closed\}
\end{array}\right.
\right.
```

**$\LaTeX$  with `amsmath`** `\[`

```
\text{curvature } R = \frac{6K}{a^2(t)} \quad
\begin{cases}
K=-1\quad&\text{open}\backslash\backslash
K=0\quad&\text{flat}\backslash\backslash
K=+1\quad&\text{closed}
\end{cases}
\]
```

## Result

$$\text{curvature } R = \frac{6K}{a^2(t)} \quad \begin{cases} K = -1 & \text{open} \\ K = 0 & \text{flat} \\ K = +1 & \text{closed} \end{cases}$$

- `amsmath` offers symbols for multiple integrals.

**T<sub>E</sub>X** `\int\!\!\!\int\int \{\rm div\}\sim\vec{\rm E}\,\{\rm d\}V`  
`= \int\!\!\!\int\int\vec{\rm E}\,\{\rm d\}\vec{\rm S}\$`

**L<sup>A</sup>T<sub>E</sub>X** `\iiint \text{div}\sim\vec{\mathrm{E}}\,\mathrm{d}V`  
`= \iiint\vec{\mathrm{E}}\,\mathrm{d}\vec{\mathrm{S}}\$`

**Result**  $\iiint \operatorname{div} \vec{E} \, dV = \iint \vec{E} \, d\vec{S}$

The `cernrep` class loads, amongst others, the `amsmath` and the `amssymb` packages. The latter package defines many supplementary commands and symbols that with T<sub>E</sub>X would have to be constructed from more basic components. See Refs. [1] and [3], or Chapter 8 of Ref. [2] for more details.

## References

- [1] Herbert Voß, *Math mode*, available at the URL <http://www.tex.ac.uk/tex-archive/info/math/voss/mathmode/Mathmode.pdf>.
- [2] Frank Mittelbach and Michel Goossens, *The L<sup>A</sup>T<sub>E</sub>X Companion*, 2nd ed. (Addison-Wesley, Boston, 2004).
- [3] Scatt Pakin, *The Comprehensive L<sup>A</sup>T<sub>E</sub>X Symbol List*, available at the URL <http://www.ctan.org/tex-archive/info/symbols/comprehensive/symbols-a4.pdf>.