The Compact Muon Solenoid Experiment

CMS Draft Note

Mailing address: CMS CERN, CH-1211 GENEVA 23, Switzerland

2014/03/04- Revision 229885 - checkout
Head Id: 229885
Archive Id: 224689:229885M
Archive Date: 2014/03/04
Archive Tag: general

TDR: the Technical Document Repository System

for the storage, concurrent access, and building of CMS reports, notes, and other LaTeX-based documents

George Alverson[1] and Lucas Taylor[2]

[1] Northeastern University
[2] Fermilab

Abstract

This note describes the TDR documentation system for LaTeX-based documents including CMS Technical Design Reports (TDRs), Expressions of Interest (EoIs), Letters of Intent (LoIs), CMS Notes, Internal Notes, and Analysis Notes. It describes the `TDR` svn repository for the storage and concurrent multi-user access of documents and the use of the `tdr` build tool for compiling complete or partial documents from users' LaTeX source and graphics files. This system has been successfully used by hundreds of authors of the CMS Computing TDR, the Physics TDR, and a number of other documents. (See also: `http://cmsdoc.cern.ch/cms/cpt/tdr/`)

Contents

1 Overview

The CMS Technical Document Repository (TDR) system provides a straightforward environment for the preparation of reports and notes by large numbers of authors working concurrently. It comprises the following components:

1.1 TDR Document Repository

All files that are required for the assembly of completed documents are stored in a central CMS svn repository (called `tdr2`). The repository contains the common style files and build tools as well as all the user-generated text (LaTeX) files and figures. This system facilitates the sharing of documents, concurrent working, and means that users do not need to keep any files in their private area.

1.2 Document style files

Common LaTeX style files have been pre-defined for CMS Technical Design Reports (also used for EoIs, LoIs, and other large documents), CMS Notes, Internal Notes, and Analysis Notes. Template examples are provided enabling the user to get started with minimal overhead.

1.3 Document build system

The philosophy of the TDR system is to keep the LaTeX document style commands distinct from the user-content. A `tdr` perl script is then provided that assembles on the fly a complete LaTeX document using pre-existing standard fragments and the users' LaTeX files. It then proceeds to build the document by processing the LaTeX, resolving cross-references and citations (using BibTeX), and creating a PDF (portable document format) file. The user selects the style of the document (CMS Note, Analysis Note, etc.) by specifying an option to the `tdr` command. It is therefore totally trivial to switch from one style to another.

1.4 External software

The system is designed to be independent of the CMS environment. All that is required is `svn`, `perl`, and a standard installation of LaTeX. These are already part of the standard CERN Linux environment. It is also relatively easy to install on non-CERN Linux systems, Mac OSX, and Windows.

1.5 Getting started

To **create a new document** in the repository, for example a CMS Note, see section 2.

To **edit the document** once the template has been created, see section 3.

To **build a formatted manuscript** (PDF) for your document see section 4.

For **advice on using LaTeX**, for example to include figures, see section 5.

2 Creating a new document

All files reside in a standard CMS svn repository (called `tdr2`). As long as you are a member of the CMS e-group, you can use a web browser to see the repository: . On any machine with the CMS environment (e.g., `lxplus.cern.ch`) you can check out either the *entire* repository or selected portions with the `svn` repository address `svn+ssh://svn.cern.ch/reps/tdr2`

2.1 Creating a new note or analysis summary

To start you will need to request a note directory in the `svn` repository from the TDR manager (currently George Alverson or Lucas Taylor). It is best to supply a list of the lxplus usernames of the co-authors who are to have write access to the repository at the time of the request.

To generate output, check out your note directory from `svn` following the example below. The `tag` below is the identifier for your paper, typically of the form XXX-YY-NNN. Following the sequence below will populate your local copy of the repository with only your note and not include the other notes. If you have a note, use "notes". For a paper, use "papers." [Note: when running without Kerberos authentication, use svn+ssh://username@svn.cern.ch... Additional information on accessing `svn` is available at the http://svn.web.cern.ch/svn/howto.php#accessing-clients]

```
> svn co -N svn+ssh://svn.cern.ch/reps/tdr2 myDir
> cd myDir
> svn update utils
> svn update -N [papers|notes]
> svn update [papers|notes]/XXX-YY-NNN
> # use the following line for tcsh. use -sh for bash.
> eval `[papers|notes]/tdr runtime -csh`
> cd [papers|notes]/XXX-YY-NNN/trunk
# (edit the template, then to build the document)
> tdr  --style=paper b XXX-YY-NNN
```

2.1.1 Working at FNAL: The LPC

The LPC environment has a script, `/uscmst1/prod/sw/cms/[cshrc|shrc]`, which sets up a number of aliased commands for working on CERN resources while at FNAL. The svn command is missing, so you'll need to fix it yourself: `alias svn 'env KRB5CCNAME=/tmp/krb_cern_`id -u` svn'` for `tcsh`,
`alias svn='KRB5CCNAME=/tmp/krb_cern_`id -u` svn'` for `bash`.

The `kserver_init` command will initialize the KRB5CCNAME file and allow for seamless communication without further intervention.

2.1.2 Naming convention for Analysis Notes and Physics Analysis Summaries

A new directory is created in the `tdr2/notes` directory, named according to the convention chosen by the analysis group, e.g. `TOP-07-005`. Once created, this directory will contain a template note named according to the analysis name, e.g. `TOP-07-005.tex`. The `tdr` script will automatically generate the `cmsNoteHeader` from the directory name.

2.1.3 Special Note on Physics Analysis Summaries

PAS documents are loaded into the CDS archives after approval. At this point, the title *as stored in the* `hypersetup pdftitle` *field* is passed to CDS as the document title. This allows for a fully formatted LaTeX title on the document and a natural language title for easy searching. The abstract, on the other hand, is taken from the `abstract` LaTeX version. Both are run through a simple-minded pre-processor for display. The preprocessor will not see any TeX macros, however, so those should should not be used.

2.1.4 Naming convention for CMS Notes, and Internal Notes

A new directory is created in the `tdr2/notes` directory, named according to the convention: `contactAuthor_serialNo`. `contactAuthor` is the CMS username (see the CERN "phonebook" command) which is used for subsequent access control. `serialNo` is a simple serial number (001, 002,...) for the note generated at the time of the request; it is *not* anything to do with the final CMS note number which will be assigned independently during the review process. For example the first note requested by Paris Sphicas resides in the directory `tdr2/notes/sphicas_001`. Once created, this directory will contain a template note called `contactAuthor_noteNo.tex` and a sub-directory called `fig` in which figures (PDF files) may be stored.

2.2 Creating a new Technical Design Report (or LoI, EoI, etc.)

For major reports, a new directory is created in the reports directory, e.g., `tdr2/reports/p1utp` for the Phase 1 Upgrade Technical Proposal. This directory will contains the following sub-directories:

- `tex` - latex files and subdirectories (e.g., for different chapters);
- `fig` - figure files and subdirectories;
- `bib` - bibtex file(s) for references.

Note that for TDRs this sub-structure is assumed to exist by the `tdr` script (described below); if you change it things may fail.

3 Modifying a document and working with svn

svn is similar in many ways to cvs. Once a repository has been checked out, the workflow is almost identical except for tagging. In svn, tagging is done by creating a new directory branch using the svn copy command. Please see the svn manual for details, particularly the chapter on branching and tagging and svn for cvs users. Please do not change the depth of the directory structure to the top-level TEX file for your document. The template is created in the trunk subdirectory, and this is what is used by default. You should also note that svn, as opposed to cvs, does allow for easily moving and copying directory trees.

Please make sure to configure your svn client: edit ~/.subversion/config so that it appropriately tags pdf files.

```
[auto-props]
*.pdf = svn:mime-type=application/pdf
*.png = svn:mime-type=image/png
*.jpg = svn:mime-type=image/jpeg
*.tex = svn:eol-style=native
*.eps = svn:mime-type=application/postscript
```

There are other useful settings as well. For example, to stop svn from asking to commit backup files and object files, you can set the global-ignores flag:

```
[miscellany]
global-ignores = *.o *.bak
```

3.1 Checking out desired files

Checkout the directory which contains the source files of the document you wish to work on. In addition to your specific note directory, you will see the following general files/directories:

- tdr - a script for building documents (described below);
- utils/general - a R/O directory containing the style files.
- tmp - a temporary directory used for output PDF, etc.

3.2 Editing the document

Simply edit any of the LATEX files with your favourite text editor. For example, for a new note, start with the file contactAuthor_noteNo.tex.

3.3 Committing your changes into the svn repository

Before committing any changes always check your changes are valid LATEX, otherwise you will break the document for all other authors.

Firstly, check the local file, e.g., myfile.tex by doing tdr build myfile.

If myfile.tex is included in a bigger document, e.g., ctdr.tex, then you must also check that this builds: tdr build ctdr. In both cases you should check that a valid PDF file is produced that looks as expected. LATEXis rather verbose with its warnings, however it is imperative to look and verify that there are no **error** messages, and no **unresolved** references.

Changes to files are committed to (i.e. stored into) the repository using

```
> svn commit -m''Comment explaining changes made''
```

The -m option should always be used to add a short informative message.

Finally: do not forget to `svn add` any new files to the repository. It is not sufficient to just do a `svn commit`. New files must be first added and then committed.

3.3.1 Checking everything is OK with svn

If you want to see the status of your local files compared to the repository type:

```
svn status
```

Run this command using the `-u` switch (`--show-updates`) to see any changes relative to the repository.

The first character of each line tells you the status of the file:

A means the file has been scheduled for addition to the repository.

M means you have modified your local copy.

D means it is scheduled for deletion.

C means there is a conflict between your version and changes downloaded from the server. Try to avoid doing this (messy) step by committing frequently.

? means you have a file locally that `svn` knows nothing about. Maybe it's meant to be local (e.g., is temporary). If you want it to be in the repository then you must use `svn add` and the `svn commit`.

***** (if run with -u or –show-updates) shows a file which has changed on the server. This is in a second column.

3.4 Creating a standalone paper, e.g., for submission to a journal

If you wish to export your paper (for publication, local work or for security), you can produce a tarball with all the necessary files with

```
> tdr --style=note --export b mynote.
```

This will function on Unix or Windows systems which have recent copies of LaTeX (including $\mathcal{AMS}$-LaTeX) and `perl` installed.

Please see also section 4.8 on formatting for journals.

4 Building a formatted manuscript

The LaTeX file(s) must be processed to produce a fully typeset and formatted manuscript in PDF (Portable Document Format). A `tdr` perl script is provided for building the whole or parts of your document, as described below. There is no need use any of the following commands yourself: `latex`, `pdflatex`, `pdftex`, `bibtex`, `dvips`, or `dvi2pdf`. They are all replaced by the `tdr` script.

4.1 Initializing your environment

Set up the runtime environment by typing:

```
> eval `./tdr runtime -sh`     // if you use Bourne-shell or Korn shell
> eval `./tdr runtime -csh`    // if you use c-shell or tc-shell
```

This must be done from the top-level directory of the checked out area, i.e. the location of the `tdr` script. Note also that the syntax uses single *back* quotation marks.

The `tdr` command has a simple scram-like syntax with `runtime`, `build`, `clean`, and `veryclean` commands, support for one-letter abbreviations and so on. For details on `tdr` options type:

```
> tdr help
```

4.2 Building a PDF file from a LaTeX file

To create a PDF file from a LaTeX file `myPaper.tex`, simply type:

```
> tdr build myPaper      (or simply:  tdr b myPaper)
```

Assuming the LaTeX files have no errors in them, the last line of the screen output will tell you the location of the output PDF file. It is stored in the top-level `tmp` directory together with various log files.

If the build fails, check the printout on the screen for LaTeX errors and resolve them; typically these are trivial syntax errors. Then run the build again.

4.3 Choosing the document style

You can choose to format the paper according to various pre-defined styles using the `style` option, for example:

```
> tdr  --style=note  build  myPaper
```

will format the paper as a CMS Note. Valid styles are

- `tdr` for large reports (the default),
- `paper` for a paper to be submitted to a journal,
- `note` for CMS Notes,
- `an` for Analysis Notes,
- `pas` for Physics Analysis Summaries,
- `in` for Internal Notes.

Note that PAS documents can be in either draft mode (the default), or non-draft, as set by the `--nodraft` switch.

4.4 What your LaTeX files should (not) contain

The `tdr` script makes a copy of your simple LaTeX file and automatically inserts all the required LaTeX boilerplate commands to produce a fully consistent LaTeX document in the `tmp` directory, in accordance with the CMS document style requested in the command line options (see above). It then processes the document using PdfLaTeX with several passes to resolve cross references; citations are handled using BibTeX.

Therefore, it should be stressed that the file `myPaper.tex` should *not* contain any document definition commands (e.g., `\documentclass`, `\begin{document}` and so on).

4.5 Making partial builds

To speed things up, especially for large documents, the `tdr` command can build single chapters, sections, or indeed any arbitrary LaTeX files. For example, if your main file is called `myPaper.tex` and looked like:

```
\input{titlepage.tex}
\input{introduction.tex}
\input{data-analysis.tex}
\input{results.tex}
```

then you could use the following commands

```
> tdr build myPaper   // build everything as a single PDF paper
> tdr b results       // build just the results section as PDF
```

In general you should be in the directory in which the LaTeX file resides. The script will search downwards in the directory tree for it, but if more than one version exists, it will not be able to determine which one to build. This situation (multiple copies of the top file) is guaranteed to occur once a tag or branch has been made, so it is important to note this.

4.6 Setting the default file to build

To save specifying your preferred build target (e.g., `myPaper.tex`) each time, just set the Unix environmental variable `TDR_TARGET` to `myPaper`. Then you can just type

```
> tdr b
```

If `TDR_TARGET` has not been set, then `tdr` builds this document.

A similar variable, `TDR_STYLE`, controls the default style.

4.7 Cleaning up

To clean up temporary files (i.e the locally-created `tmp` directory):

```
> tdr clean
```

To clean up temporary files and emacs and nedit backup files:

```
> tdr veryclean
```

4.8 Formatting for Journals

You can produce versions of your document formatted following the standards of several of the journals to which CMS submits physics results. Journal-specific options are passed as strings. To use our defaults, use a single dash as the option:

```
tdr --style paper --aps - b XXX-08-000
```

Please note that the `tdr` script can automatically take the pdfkeywords and format them for the equivalent journal field.

APS use the normal command for a paper, but add the appropriate APS options with, e.g., `--aps="reprint,prl,linenumbers"`. See the revtex documentation for details on APS options. Information on the revtex style for use with APS journals can be found at `http://authors.aps.org/revtex4/` and download sites are listed at `https://authors.aps.org/revtex4/revtex4_faq.html#download`. APS does not accept sub-directories nor included TEXfiles, so the necessary files will either be included or moved to the top level, as appropriate, for submission.

PLB use `--plb="3p,twocolumn,times"` or any other set of Elsevier options. See `http://www.elsevier.com/framework_authors/misc/elsdoc.pdf` for details on the Elsevier elsarticle style. As for the APS, PLB only accepts a flat file structure. The PLB default bib style will convert to lowercase all except the first word in the titles of references, so escape proper names, acronyms, etc., with curly braces, e.g., "`Search for {ADD} extra dimens`

EPJC Please provide (using the if-then construction described below) a `\titlerunning` in the text before the `\maketitle`. This is used to create a running head so it cannot be longer than roughly half a page width. When EPJC sets articles, they tend to use the `\sidecaption` macro and have caption plus two small plots run across the full page. This option is not accessible in the CMS style although one can pass it to the EPJC style via an if-then.

JHEP JHEP accepts papers in the CMS style.

For instances where the CMS style and the journal style are incompatible, one may use an *if-then* construction to bracket alternatives:

```
\ifthenelse{\boolean{cms@external}}{%
%% journal specific text
}
{%
%CMS specific text
}
```

Note, however, that many formatting changes that are required for the two-column format of many journals can be accommodated in the standard CMS style. Using the $\star$ format for figures that should extend across two columns does not effect placement for us. If you resize figures, use units of `\columnwidth`, which is the same as the `\textwidth` in single column format.

4.9 Supplemental Material for Journals

Supplemental material should be placed in an independent LaTeX file, e.g., supplemental_material.tex. This file will be included via conditional code in the main document (say GEN-12-001.tex, representing a GENeric document) when it is formatted for CMS and for the arXiv, and excluded in the journal version. A third file, GEN-12-001_supp.tex should have the supplemental material included wrapped in a standard document template, which will provide an independent file for uploading to the journal. So for GEN-12-001.tex,

```
...
\bibliography{auto_generated}
\ifthenelse{\boolean{cms@external}}{}{
\clearpage
\appendix
\section{Supplemental information title\label{app:suppMat}}
\input{supplemental_material}
}
```

while for GEN-12-001_supp.tex,

```
\title{GEN-12-001 normal title \texorpdfstring{\\[1cm]
---Supplemental Material---}{: Supplemental Material}}
\author[cern]{The CMS Collaboration}
\date{\today}
\abstract{}
\hypersetup{%
...}
\maketitle
\null\cleardoublepage
\input{supplemental_material}
```

The title of GEN-12-001 should be modified from that of the normal document: `\title{`Normal Title`\\[1cm]`—Supplemental Material—`}`. To generate all three types of files, arXiv (same as CMS format), PRL, and PRL supplement, the commands would be

```
tdr --style paper --aps - b GEN-12-001
tdr --style paper  b GEN-12-001
tdr --style paper --supplement --no-draft --preflight b GEN-12-001_supp
```

You should specifically note how the supplemental material is referenced within the main file: the APS specifies, for instance, that the format for the reference in the text is "See Supplemental Material at [URL will be inserted by publisher] for [give brief description of material]," so we use (for example) "The results are available in tabulated form in `\suppMaterial`", where we have defined `\suppMaterial` in the GEN-12-001_supp.tex file as

```
\ifthenelse{\boolean{cms@external}}
{\providecommand{\suppMaterial}{the supplemental material
  [URL will be inserted by publisher]}}
{\providecommand{\suppMaterial}{Appendix~\ref{app:suppMat}}}
```

In the absence of a table of contents we can freely substitute anything we like for "Appendix" in the string above. If there is a table of contents, the `\appendixname` should be conditionally redefined so that in CMS format it would be `\renewcommand{\appendixname}{`Supplemental Material`}`.

5 Advice on using LaTeX

5.1 LaTeX macros for commonly used constructs

Provisions are made to implement macros across TDR volumes, within a volume, or even locally in a particular section. However, in order to establish a standard look and feel for the text symbols in the TDR volumes (such as for E_{T} and p_{T}), we encourage use of the generally defined macros and strongly discourage local use unless you are certain a similar symbol would not be used by another editor.

At the top-most level, definitions defined in `tdr2/utils/trunk/general/ptdr-definitions.tex` are available to all TDR volumes. An extensive set of macros have been defined there and should be used whenever possible. They include, for example, `\ET`, `\fbinv`, `\sTop`, etc. At the top-level of each TDR (e.g., in `tdr2/reports/ptdr1/trunk/tex/definitions.tex`, there is another file `definitions.tex` for volume-specific definitions. Macros should be suggested and implemented for frequently used constructs or common symbols or names, e.g., `\etc` could be defined to produce "*etc.*" and so on. The macros in the `definitions.tex` files are usable in tex files at all levels of the particular TDR.

Use `\newcommand` to define a new command that does not exist, `\renewcommand` to re-define a new command that already exists, or `\providecommand` to define a new command but accept the old definition without complaint if it has already been defined.

To override a general definition in `TDR/general/ptdr-definitions.tex` simply (re-)define it in the local `definitions.tex`. But please consult with the appropriate TDR editor.

We stress that it is important to use the macros in case a global style change must be made to suit the standards of a particular journal.

5.2 Fonts

Do not override the default fonts. They are currently set to be Palatino and Helvetica. The math fonts have also been changed to Palatino so that they do not clash with the body text, particularly in regards to numbers and units. This means the authors should use `\text` commands to put text in subscripts and superscripts, and most importantly *do not use* `\rm` in formulas, otherwise you will end up with formulae looking like the second one below.

$$\phi = \text{a Greek letter} \tag{1}$$

$$\mathrm{\Phi} = \text{a mistake} \tag{2}$$

Also note that the math fonts include a full set of Greek symbols in Math Italic Bold (produced with `\mathbold`), but only uppercase in Math Bold (`\mathbf`). Use `\boldmath` or `\boldsymbol` to get bold symbols: `{\boldmath{$\alpha \otimes \beta$}}` : $\boldsymbol{\alpha \otimes \beta}$. (Note the enclosing braces.) Most journal styles do not have the `\boldmath` command.

It is also advisable to use the `\textrm{Some text}` form rather than `{\rm Some text}`. The same is true for the other short-form holdovers from plain TeX, `\tt` and `\it`, particularly if you would like to submit your paper to a journal with minimal re-editing.

5.3 Editorial macros

In addition to the extensive measurement and physics symbols, some editorial macros are defined in `tdr2/utils/trunk/general/definitions.tex` as well. For example, the fol-

lowing tex fragment:

```
\editor{Jane Doe} \\
\contributor{Tom Cobbley} \\
\fixme{check this number!} \\
```

produces the following.

Editor(s): Jane Doe

Contributor(s): Tom Cobbley

FIXME: check this number!

Notes use `author`, `address`, and `abstract` commands.

5.4 Inclusion of Figures

Figures should reside in the `fig` directory of the corresponding TDR (volume). A figure may be included as follows:

```
Figure~\ref{fig:test} shows a figure prepared with the TDR
template and illustrates how to include a picture in a document
and refer to it using a symbolic label.
\begin{figure}[!Hhtb]
   \centering
   \includegraphics{width=0.55\textwidth}{c1_BlackAndWhite}
   \caption[Caption for TOC]{Test of graphics inclusion.\label{fig:test}}
\end{figure}
```

Please note that documents intended for journal submission should usually include the `fig` in the path name supplied to `includegraphics` and not rely on the automatic search.

The result of the above is roughly as follows:

> Figure 1 shows a figure prepared with the TDR template and illustrates how to include a picture in a document and refer to it using a symbolic label.

Note that the file extension (type) for the filename (e.g., `c1_BlackAndWhite.pdf` above) is not explicitly specified. Also note that authors should use an alternate short caption within the first set of brackets when the complete caption is unduly long for including in the list of figures in the Table of Contents.

Also note that the current recommended size for figures is `0.55\textwidth` for square plots, and `0.7\textwidth` for ones with a standard (i.e., produced using the root template described in Section 5.4.5) rectangular aspect ratio.

Finally, note that correct results for the labeling occur only if you place the `label` command within the caption environment.

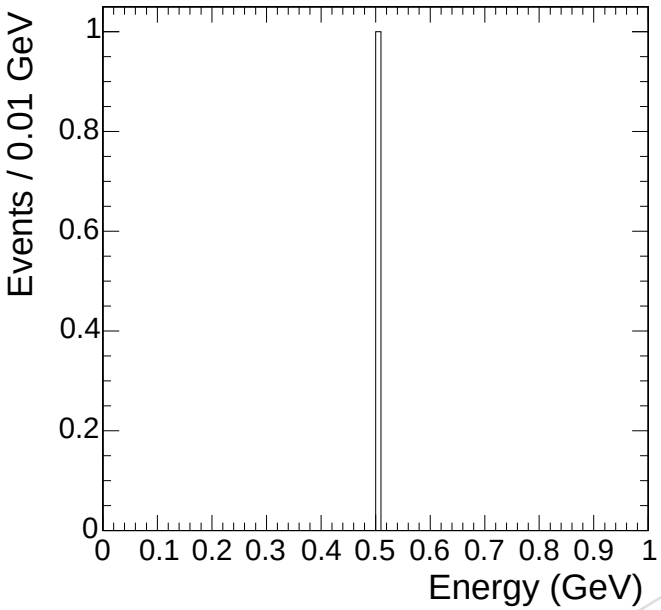

Figure 1: Test of graphics inclusion.

5.4.1 Colour Figures

Figures will generally be printed in black and white for paper versions of the final document. We have found that the automatic conversion of colour figures to black and white often results in a lack of legibility, so we recommend that all authors provide a black and white version for each figure which they have checked for legibility on an actual paper copy.

Colour versions of figures can by provided for PDF output using the `combinedfigure` macro in place of the `\includegraphics` command. This takes two arguments corresponding respectively to the black and white and the coloured versions of the same picture, for example:

```
Figure~\ref{fig:test} shows a figure prepared with the TDR
template and illustrates how to include a picture in a document
and refer to it using a symbolic label.
\begin{figure}[!Hhtb]
   \centering
   \combinedfigure{width=0.4\textwidth}{c1_BlackAndWhite}{c1_Colour}
   \caption[Caption for TOC]{Test of graphics inclusion.\label{fig:test}}
\end{figure}
```

Both figures should have the same size or the pagination may be affected.

5.4.2 How to include multiple figures

If you need to include multiple figures into the figure environment (i.e., you need only one common caption), the recommended procedure is to use multiple instances of the `\includegraphics` command, combined with the `tabular` environment if needed. Please do not use the `subfig` environment just to get "(a)" and "(b)" labels, it is a waste of white space and does not look as nice as putting the labels directly on the plot. Moreover, do not use the `picture` environment to draw the labels, because the coordinate system is absolute on the page and not relative to where the figure will be placed (i.e., this only works for the very final version). In short, to label

multiple figures, it is best to embed the label into the plot.

5.4.3 How to handle figures in PDF, jpeg, and PS formats

Files with extensions of `.pdf` (recommended) and `.jpg` are automatically picked up. Direct import of `.eps` files is not supported by the `pdftex` driver which is used to convert LaTeX to PDF. You are advised to convert your `.eps` file to a `.pdf` file using Adobe Acrobat (best results), the `epstopdf` command or `ps2pdf -dEPSCrop`, and commit that to `svn`.[1] Try to avoid converting figures through an intermediate program, such as Powerpoint, and instead convert the natively produced Postscript. If you do convert an EPS file, you are encouraged to also commit the original EPS version as well in case of conversion problems found later. The editors may re-convert if necessary.

Also, keep in mind that some later versions of PDF (e.g., 1.5) will conflict with the PdfLaTeX machinery on many systems, including `lxplus` so please save figures (e.g., from Distiller) with version 1.3 or 1.4, if possible.

5.4.4 Where to store figures

In general the figures should reside in the `fig` directory or one of its subdirectories. A `fig` directory exists for each major document, e.g., `tdr2/reports/ptdr1/trunk/fig/` or `tdr2/reports/ctdr`. Small papers with only a few figures do not require the use of a subdirectory.

Do *not* refer to any figures which reside outside the TDR repository; instead, `svn add` the file in the `fig` directory and check it in.

By default figures are looked for in the `fig` directory.

If a figure file resides in a subdirectory, e.g., `fig/muon`, of the `fig` directory, then simply prepend the directory name when referring to the figure in the `\includegraphics` command (i.e. `muon/c1` in the above example).

5.4.5 Standard macro for figures produced with ROOT

To maintain a standard look and feel for the figures in the Physics TDRs, a Root macro was contributed by Thomas Speer. Figure 1 shows an example plot made using it. In the TDR repository check out: `tdr2/utils/trunk/general/tdrstyle.C`. To use it:

```
.L tdrstyle.C
setTDRStyle()
```

5.5 Convention for figure and table captions

Figure captions should be located below each figure, as shown in the example above. Table captions, however, should reside *above* the table and use `topcaption`. For example:

```
\begin{table}[h]
  \begin{center}
    \topcaption{Table captions are above the table whereas figure
    captions are below.}
```

[1] An alternative approach would be to use LaTeX plus `pstopdf`. However, this often fails to produce correct `.ps` and hence `.pdf` output files; nor does it support the inclusion of `.pdf` or `.jpg` pictures which are generally much more compact than the corresponding `.eps` files.

```
    \label{tab:mytab}
    \begin{tabular}{lcc} \hline
       Parameter & Value 1 & Value 2 \\ \hline
       $s$ & 10.0 & 20.0 \\
       $t$ & 20.0 & 30.0 \\
       $u$ & 30.0 & 40.0 \\ \hline
    \end{tabular}
  \end{center}
\end{table}
```

which produces the following:

Table 1: Table captions are above the table whereas figure captions are below.

Parameter	Value 1	Value 2
s	10.0	20.0
t	20.0	30.0
u	30.0	40.0

5.6 Chapters, Sections and Other Sectioning Commands

For all notes use the following section heading commands: `\section`, `\subsection`, `\subsubsection`, and `\paragraph`. For Technical Design Reports the top-level sectioning command is `\chapter` followed by all the above sectioning commands.

The PDF bookmarks produced from PdfLaTeX will choke on TeXsymbols, e.g., "2.6 This is a "026E30Fsection" for "2.6 This is a \section" since TeX uses 026E30F to represent the backslash. Use the `\texorpdfstring` macro:

```
\section{Finding the split \texorpdfstring{$A_2$}{A2}}
```

And this is what it should look like:

5.7 This is a `\subsection`

This is some text.

5.7.1 This is a `\subsubsection`

This is some text.

5.7.1.1 This is a `\paragraph` This is some text.

5.8 Cross-references and bibliographic citations

5.8.1 Referring to Sections, Figures, Tables, etc.

LaTeX provides powerful, robust, and scalable facilities for cross-referencing based on symbolic labels. Please use them!

For example, to create symbolic links to a chapter and a section:

```
   \chapter{Mass Storage Systems\label{ch:mss}}
   \section{Requirements\label{sec:mss-requirements}}
```

Note that the `label` command is contained *within* the curly braces of the appropriate sectioning command so that the value can be resolved correctly. For figures and tables, the `label` command should be similarly enclosed within the associated `caption` command.

To then refer to the chapter and section:

```
The CMS hierarchical mass storage systems, described in
Chapter~\ref{ch:mss} will be of a size unprecedented in
HEP, as described in Section~\ref{sec:mss-requirements}.
```

This will result in output something like:

> The CMS hierarchical mass storage systems, described in Chapter 9 will be of a size unprecedented in HEP, as described in Section 9.1.

Note that the numbers (9 and 9.1) are automatically generated according to the placement of the `label` commands in the overall context of the document. The number of digits (levels) is determined automatically from the level of the sectioning command used (chapter, section, subsection, etc.).

Always – *repeat always* – use symbolic labels (e.g., `sec:mss-requirements`) for references and not hardwired numbers (e.g., `9.1`) as the latter will invariably become wrong very quickly.

5.8.2 Bibliographic References

All bibliographic entries are defined in a BibTeX file (i.e., files with `.bib` extension in the `bib` directory of the TDR (volume) of interest. This enables a standard format to be ensured and helps avoid duplicated entries. Before defining a new bibliographic item, please check in the `.bib` files whether it has already been defined, and if so then use it as it is. When creating new BibTeX entries, the format of the bibliographic entries is mostly self-evident and one can cut-and-paste from an existing entry (well, check that it produces reasonable output) and then change the text.

Keep in mind that for listing authors, the BibTeX implementation uses "Last Name, First Name" (and it automatically abbreviates the first name). Concatenate authors using "and", and instead of writing "*et al.*" use "and others." BibTeX will handle the substitution, and our style file will trim the author list automatically after three authors. For complicated names, you can place them in braces , but do this sparingly.

We strongly recommend the use of the inSPIRE[2] BibTeX labels when such an article can be found there, because a unique label is created and LaTeX can spot multiply-defined references. It also saves you the time of creating the entry yourself. Such an entry looks like:

```
@Article{Agostinelli:2002hh,
     author    = "Agostinelli, S. and others",
     collaboration = "GEANT4",
     title     = "{GEANT4}---a simulation toolkit",
     journal   = nim,
     volume    = "A506",
     year      = "2003",
     pages     = "250-303",
```

[2] `http://inspirehep.net`

```
      SLACcitation  = "%%CITATION = NUIMA,A506,250;%%",
      DOI       = "10.1016/S0168-9002(03)01368-8"
}
```

However, in the above instance and for many other *commonly* cited references, we will use a more conventional name (e.g., GEANT4 instead of Agostinelli:2002hh). So please check the other bibliography files to see if yours is already defined. The information should also be verified. In the above citation, the title was not quite right on inSPIRE.

In addition, we recommend setting the "DOI" field that was added to the Article BibTeX format in the TDR framework (and is illustrated above). This field represents the Digital Object Identifier for your reference.[3] When you prepend this number with `http://dx.doi.org/`, your browser is automatically directed to the electronic version of the article (provided your institution has paid for this access). Currently you need to manually determine and enter this field after examining the publication.

To refer to an item in the bibliography using its symbolic label in your text, use one of the following forms:

```
Either: the CMS detector is described elsewhere~\cite{CMSTP};
or: the CMS detector is described in reference~\citenum{CMSTP}.
```

This will result in output something like:

> Either: the CMS detector is described elsewhere [34]; or: the CMS detector is described in reference 34.

Note the omission of the square brackets in the second form, where the reference is explicitly (rather than parenthetically) referred to.

The list of references will be placed at the end of the TDR. It is suggested that each group maintain a separate `.bib` file in the `bib` directory for the chapter specific references. Common references for the entire TDR will be kept in a common file (e.g., ptdr1.bib). Common software references will be kept in software.bib.

5.8.3 Web References

Please use the `\href` and `\url` commands to embed links into your document.

Example:
`\url{http://cms.cern.ch/iCMS/}` gives `http://cms.cern.ch/iCMS/`,
`\href{http://cms.cern.ch/iCMS/}{The CMS web site}` gives The CMS web site.

5.9 Glossary

Please add a short entry to `glossary.tex` whenever introducing any new acronym or abbreviation. Even plain English terms with specific technical meaning should be included (e.g., Python).

[3] `http://www.doi.org/`

6 PTDR Symbol Definitions

etal:	et al.
ie:	i.e.
eg:	e.g.
etc:	etc.
vs:	*vs.*
mdash:	—
Lone:	Level-1
Ltwo:	Level-2
Lthree:	Level-3
ACERMC:	ACERMC
ALPGEN:	ALPGEN
CHARYBDIS:	CHARYBDIS
CMKIN:	CMKIN
CMSIM:	CMSIM
CMSSW:	CMSSW
COBRA:	COBRA
COCOA:	COCOA
COMPHEP:	COMPHEP
EVTGEN:	EVTGEN
FAMOS:	FAMOS
GARCON:	GARCON
GARFIELD:	GARFIELD
GEANE:	GEANE
GEANTfour:	GEANT4
GEANTthree:	GEANT3
GEANT:	GEANT
HDECAY:	HDECAY
HERWIG:	HERWIG
HIGLU:	HIGLU
HIJING:	HIJING
IGUANA:	IGUANA
ISAJET:	ISAJET
ISAPYTHIA:	ISAPYTHIA
ISASUGRA:	ISASUGRA
ISASUSY:	ISASUSY
ISAWIG:	ISAWIG
MADGRAPH:	MADGRAPH
MCATNLO:	MC@NLO
MCFM:	MCFM
MILLEPEDE:	MILLEPEDE
ORCA:	ORCA
OSCAR:	OSCAR
PHOTOS:	PHOTOS
PROSPINO:	PROSPINO
PYTHIA:	PYTHIA
SHERPA:	SHERPA
TAUOLA:	TAUOLA
TOPREX:	TOPREX
XDAQ:	XDAQ
DZERO:	D0
de:	$^\circ$
ten{x}:	$\times 10^{x}$
unit{x}:	x
mum:	μm
micron:	μm
cm:	cm
mm:	mm
mus:	μs
keV:	keV
MeV:	MeV
GeV:	GeV
TeV:	TeV
PeV:	PeV
keVc:	keV/c
MeVc:	MeV/c
GeVc:	GeV/c
TeVc:	TeV/c
keVcc:	keV/c^2
MeVcc:	MeV/c^2
GeVcc:	GeV/c^2
TeVcc:	TeV/c^2
pbinv:	pb^{-1}
fbinv:	fb^{-1}
nbinv:	nb^{-1}
percms:	$\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
lumi:	$\mathcal{L}$
Lumi:	$\mathcal{L}$
LvLow:	$\mathcal{L} = 10^{32}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
LLow:	$\mathcal{L} = 10^{33}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
lowlumi:	$\mathcal{L} = 2\times 10^{33}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
LMed:	$\mathcal{L} = 2\times 10^{33}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
LHigh:	$\mathcal{L} = 10^{34}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
hilumi:	$\mathcal{L} = 10^{34}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}$
zp:	Z'
kt:	k_T
BC:	$\mathrm{B_c}$
bbarc:	$\mathrm{b\bar{c}}$
bbbar:	$\mathrm{b\bar{b}}$
ccbar:	$\mathrm{c\bar{c}}$
JPsi:	J/ψ
bspsiphi:	$\mathrm{B_s} \to \mathrm{J}/\psi\,\phi$
AFB:	A_FB
EE:	$\mathrm{e^+e^-}$
MM:	$\mu^+\mu^-$
TT:	$\tau^+\tau^-$
wangle:	$\sin^2\theta^{\mathrm{lept}}_{\mathrm{eff}}(M_\mathrm{Z}^2)$
ttbar:	$\mathrm{t\bar{t}}$
stat:	(stat.)
syst:	(syst.)

HGG:	$H \to \gamma\gamma$	
gev:	GeV	
GAMJET:	$\gamma + \text{jet}$	
PPTOJETS:	$pp \to \text{jets}$	
PPTOGG:	$pp \to \gamma\gamma$	
PPTOGAMJET:	$pp \to \gamma + \text{jet}$	
MH:	M_H	
RNINE:	R_9	
DR:	ΔR	
PT:	p_T	
pt:	p_T	
ET:	E_T	
HT:	H_T	
et:	E_T	
Em:	$\not{E}$	
Pm:	$\not{p}$	
PTm:	$\not{p}_T$	
ETm:	E_T^{miss}	
MET:	E_T^{miss}	
ETmiss:	E_T^{miss}	
VEtmiss:	$\vec{E}_T^{miss}$	
dd{y}{x}:	$\frac{dy}{dx}$	
ga:	$\gtrsim$	
la:	$\lesssim$	
swsq:	$\sin^2\theta_W$	
cwsq:	$\cos^2\theta_W$	
tanb:	$\tan\beta$	
tanbsq:	$\tan^2\beta$	
sidb:	$\sin 2\beta$	
alpS:	α_S	
alpt:	$\tilde{\alpha}$	
QL:	Q_L	
sQ:	$\widetilde{Q}$	
sQL:	$\widetilde{Q}_L$	
ULC:	U_L^C	
sUC:	$\widetilde{U}^C$	
sULC:	$\widetilde{U}_L^C$	
DLC:	D_L^C	
sDC:	$\widetilde{D}^C$	
sDLC:	$\widetilde{D}_L^C$	
LL:	L_L	
sL:	$\widetilde{L}$	
sLL:	$\widetilde{L}_L$	
ELC:	E_L^C	
sEC:	$\widetilde{E}^C$	
sELC:	$\widetilde{E}_L^C$	
sEL:	$\widetilde{E}_L$	
sER:	$\widetilde{E}_R$	
sFer:	$\widetilde{f}$	
sQua:	$\widetilde{q}$	
sUp:	$\widetilde{u}$	
suL:	$\widetilde{u}_L$	
suR:	$\widetilde{u}_R$	
sDw:	$\widetilde{d}$	
sdL:	$\widetilde{d}_L$	
sdR:	$\widetilde{d}_R$	
sTop:	$\widetilde{t}$	
stL:	$\widetilde{t}_L$	
stR:	$\widetilde{t}_R$	
stone:	$\widetilde{t}_1$	
sttwo:	$\widetilde{t}_2$	
sBot:	$\widetilde{b}$	
sbL:	$\widetilde{b}_L$	
sbR:	$\widetilde{b}_R$	
sbone:	$\widetilde{b}_1$	
sbtwo:	$\widetilde{b}_2$	
sLep:	$\widetilde{l}$	
sLepC:	$\widetilde{l}^C$	
sEl:	$\widetilde{e}$	
sElC:	$\widetilde{e}^C$	
seL:	$\widetilde{e}_L$	
seR:	$\widetilde{e}_R$	
snL:	$\widetilde{\nu}_L$	
sMu:	$\widetilde{\mu}$	
sNu:	$\widetilde{\nu}$	
sTau:	$\widetilde{\tau}$	
Glu:	g	
sGlu:	$\widetilde{g}$	
Wpm:	$W^\pm$	
sWpm:	$\widetilde{W}^\pm$	
Wz:	W^0	
sWz:	$\widetilde{W}^0$	
sWino:	$\widetilde{W}$	
Bz:	B^0	
sBz:	$\widetilde{B}^0$	
sBino:	$\widetilde{B}$	
Zz:	Z^0	
sZino:	$\widetilde{Z}^0$	
sGam:	$\widetilde{\gamma}$	
chiz:	$\widetilde{\chi}^0$	
chip:	$\widetilde{\chi}^+$	
chim:	$\widetilde{\chi}^-$	
chipm:	$\widetilde{\chi}^\pm$	
Hone:	H_d	

sHone:	$\widetilde{\mathrm{H}}_{\mathrm{d}}$	
Htwo:	H_{u}	
sHtwo:	$\widetilde{\mathrm{H}}_{\mathrm{u}}$	
sHig:	$\widetilde{\mathrm{H}}$	
sHa:	$\widetilde{\mathrm{H}}_{\mathrm{a}}$	
sHb:	$\widetilde{\mathrm{H}}_{\mathrm{b}}$	
sHpm:	$\widetilde{\mathrm{H}}^{\pm}$	
hz:	h^{0}	
Hz:	H^{0}	
Az:	A^{0}	
Hpm:	$\mathrm{H}^{\pm}$	
sGra:	$\widetilde{\mathrm{G}}$	
mtil:	$\widetilde{m}$	
rpv:	$\not{R}$	
LLE:	$LL\bar{E}$	
LQD:	$LQ\bar{D}$	
UDD:	$\overline{UDD}$	
Lam:	λ	
Lamp:	λ'	
Lampp:	λ''	
MD:	M_{D}	
Mpl:	M_{Pl}	
Rinv:	R^{-1}	

7 Particle Symbols

PAz:	A^0
PBm:	B^-
PBpm:	$B^\pm$
PBp:	B^+
PBz:	B^0
PB:	B
PDiz:	$D_1(2420)^0$
PDm:	D^-
PDpm:	$D^\pm$
PDp:	D^+
PDstiiz:	$D_2^*(2460)^0$
PDstpm:	$D^*(2010)^\pm$
PDstz:	$D^*(2010)^0$
PDz:	D^0
PD:	D
PEz:	E^0
PHpm:	$H^\pm$
PHz:	H^0
PJgy:	$J/\psi(1S)$
PKeiii:	K_{e3}
PKgmiii:	$K_{\mu 3}$
PKia:	$K_1(1400)$
PKii:	$K_2(1770)$
PKi:	$K_1(1270)$
PKm:	K^-
PKpm:	$K^\pm$
PKp:	K^+
PKsta:	$K^*(1370)$
PKstb:	$K^*(1680)$
PKstiii:	$K_3^*(1780)$
PKstii:	$K_2^*(1430)$
PKstiv:	$K_4^*(2045)$
PKstz:	$K_0^*(1430)$
PKst:	$K^*(892)$
PKzL:	K_L^0
PKzS:	K_S^0
PKzeiii:	K_{e3}^0
PKzgmiii:	K_3^0
PKz:	K^0
PK:	K
PLpm:	$L^\pm$
PLz:	L^0
PN:	N
PNa:	$N(1440)P_{11}$
PNb:	$N(1520)D_{13}$
PNc:	$N(1535)S_{11}$
PNd:	$N(1650)S_{11}$
PNe:	$N(1675)D_{15}$
PNf:	$N(1680)F_{15}$
PNg:	$N(1700)D_{13}$
PNh:	$N(1710)P_{11}$
PNi:	$N(1720)P_{13}$
PNj:	$N(2190)G_{17}$
PNk:	$N(2220)H_{19}$
PNl:	$N(2250)G_{19}$
PNm:	$N(2600)I_{1,11}$
PSHpm:	$\widetilde{H}^{\pm}_j$
PSHz:	$\widetilde{H}^0_j$
PSWpm:	$\widetilde{W}^\pm$
PSZz:	$\widetilde{Z}^0$
PSe:	$\widetilde{e}$
PSgg:	$\widetilde{\gamma}$
PSgm:	$\widetilde{\mu}$
PSgn:	$\widetilde{\nu}$
PSgt:	$\widetilde{\tau}$
PSgxpm:	$\widetilde{\chi}_i^\pm$
PSgxz:	$\widetilde{\chi}_i^0$
PSg:	$\widetilde{g}$
PSq:	$\widetilde{q}$
PWR:	W_R
PWm:	W^-
PWpr:	W'
PWp:	W^+
PW:	W
PZLR:	Z_{LR}
PZgc:	Z_χ
PZge:	Z_η
PZgy:	Z_ψ
PZi:	Z_1
PZz:	Z^0
PaBz:	$\overline{B}^0$
PaB:	$\overline{B}$
PaDz:	$\overline{D}^0$
PaD:	$\overline{D}$
PaKz:	$\overline{K}^0$
PaSq:	$\overline{\widetilde{q}}$
PagL:	$\overline{\Lambda}$
PagOp:	$\overline{\Omega}^+$
PagSm:	$\overline{\Sigma}^-$
PagSp:	$\overline{\Sigma}^+$
PagSz:	$\overline{\Sigma}^0$
PagXp:	$\overline{\Xi}^+$

908	PagXz:	$\overline{\Xi}^0$
909	Pagne:	$\overline{\nu}_e$
910	Pagngm:	$\overline{\nu}_\mu$
911	Pagngt:	$\overline{\nu}_\tau$
912	Paii:	$a_2(1320)$
913	Pai:	$a_1(1260)$
914	Pap:	$\overline{p}$
915	Paqb:	$\overline{q}_b$
916	Paqc:	$\overline{q}_c$
917	Paqd:	$\overline{q}_d$
918	Paqs:	$\overline{q}_s$
919	Paqt:	$\overline{q}_t$
920	Paqu:	$\overline{q}_u$
921	Paq:	$\overline{q}$
922	Paz:	$a_0(980)$
923	Pbgcia:	$\chi_{b1}(2P)$
924	Pbgciia:	$\chi_{b2}(2P)$
925	Pbgcii:	$\chi_{b2}(1P)$
926	Pbgci:	$\chi_{b1}(1P)$
927	Pbgcza:	$\chi_{b0}(2P)$
928	Pbgcz:	$\chi_{b0}(1P)$
929	Pbi:	$b_1(1235)$
930	PcgLp:	Λ_c^+
931	PcgS:	$\Sigma_c(2455)$
932	PcgXp:	Ξ_c^+
933	PcgXz:	Ξ_c^0
934	Pcgcii:	$\chi_{c2}(1P)$
935	Pcgci:	$\chi_{c1}(1P)$
936	Pcgcz:	$\chi_{c0}(1P)$
937	Pcgh:	$\eta_c(1S)$
938	Pem:	e^-
939	Pep:	e^+
940	Pe:	e
941	Pfia:	$f_1(1390)$
942	Pfib:	$f_1(1510)$
943	Pfiia:	$f_2(1720)$
944	Pfiib:	$f_2(2010)$
945	Pfiic:	$f_2(2300)$
946	Pfiid:	$f_2(2340)$
947	Pfiipr:	$f_2'(1525)$
948	Pfii:	$f_2(1270)$
949	Pfiv:	$f_4(2050)$
950	Pfi:	$f_1(1285)$
951	Pfza:	$f_0(1400)$
952	Pfzb:	$f_0(1590)$
953	Pfz:	$f_0(975)$
954	PgD:	Δ
955	PgDa:	$\Delta(1232)P_{33}$
956	PgDb:	$\Delta(1620)S_{31}$
957	PgDc:	$\Delta(1700)D_{33}$
958	PgDd:	$\Delta(1900)S_{31}$
959	PgDe:	$\Delta(1905)F_{35}$
960	PgDf:	$\Delta(1910)P_{31}$
961	PgDh:	$\Delta(1920)P_{33}$
962	PgDi:	$\Delta(1930)D_{35}$
963	PgDj:	$\Delta(1950)F_{37}$
964	PgDk:	$\Delta(2420)H_{3,11}$
965	PgL:	Λ
966	PgLa:	$\Lambda(1405)S_{01}$
967	PgLb:	$\Lambda(1520)D_{03}$
968	PgLc:	$\Lambda(1600)P_{01}$
969	PgLd:	$\Lambda(1670)S_{01}$
970	PgLe:	$\Lambda(1690)D_{03}$
971	PgLf:	$\Lambda(1800)S_{01}$
972	PgLg:	$\Lambda(1810)P_{01}$
973	PgLh:	$\Lambda(1820)F_{05}$
974	PgLi:	$\Lambda(1830)D_{05}$
975	PgLj:	$\Lambda(1890)P_{03}$
976	PgLk:	$\Lambda(2100)G_{07}$
977	PgLl:	$\Lambda(2110)F_{05}$
978	PgLm:	$\Lambda(2350)H_{09}$
979	PgO:	Ω
980	PgOm:	Ω^-
981	PgOma:	$\Omega(2250)^-$
982	PgS:	Σ
983	PgSa:	$\Sigma(1385)P_{13}$
984	PgSb:	$\Sigma(1660)P_{11}$
985	PgSc:	$\Sigma(1670)D_{13}$
986	PgSd:	$\Sigma(1750)S_{11}$
987	PgSe:	$\Sigma(1775)D_{15}$
988	PgSf:	$\Sigma(1915)F_{15}$
989	PgSg:	$\Sigma(1940)D_{13}$
990	PgSh:	$\Sigma(2030)F_{17}$
991	PgSi:	$\Sigma(2050)$
992	PgSm:	Σ^-
993	PgSp:	Σ^+
994	PgSz:	Σ^0
995	PgU:	Υ
996	PgUa:	$\Upsilon(1S)$
997	PgUb:	$\Upsilon(2S)$
998	PgUc:	$\Upsilon(3S)$
999	PgUd:	$\Upsilon(3S)$
1000	PgUe:	$\Upsilon(10860)$
1001	PgUf:	$\Upsilon(11020)$
1002	PgX:	Ξ
1003	PgXa:	$\Xi(1530)P_{13}$
1004	PgXb:	$\Xi(1690)$
1005	PgXc:	$\Xi(1820)D_{13}$
1006	PgXd:	$\Xi(1950)$

1007	PgXe:	$\Xi(2030)$
1008	PgXm:	Ξ^-
1009	PgXz:	Ξ^0
1010	Pgfa:	$\phi(1680)$
1011	Pgfiii:	$\phi_3(1850)$
1012	Pgf:	$\phi(1020)$
1013	Pgg:	γ
1014	Pgha:	$\eta(1295)$
1015	Pghb:	$\eta(1440)$
1016	Pghpr:	$\eta'(958)$
1017	Pgh:	η
1018	Pgmm:	μ^-
1019	Pgmp:	μ^+
1020	Pgm:	μ
1021	Pgne:	ν_e
1022	Pgngm:	ν_μ
1023	Pgngt:	ν_τ
1024	Pgoa:	$\omega(1390)$
1025	Pgob:	$\omega(1600)$
1026	Pgoiii:	$\omega_3(1670)$
1027	Pgo:	$\omega(783)$
1028	Pgpa:	$\pi(1300)$
1029	Pgpii:	$\pi_2(1670)$
1030	Pgpm:	π^-
1031	Pgppm:	$\pi^\pm$
1032	Pgpp:	π^+
1033	Pgpz:	π^0
1034	Pgp:	π
1035	Pgra:	$\rho(1450)$
1036	Pgrb:	$\rho(1700)$
1037	Pgriii:	$\rho_3(1690)$
1038	Pgr:	$\rho(770)$
1039	Pgt:	τ
1040	Pgya:	$\psi(3770)$
1041	Pgyb:	$\psi(4040)$
1042	Pgyc:	$\psi(4160)$
1043	Pgyd:	$\psi(4415)$
1044	Pgy:	$\psi(2S)$
1045	Phia:	$h_1(1170)$
1046	Pn:	n
1047	Pp:	p
1048	Pqb:	q_b
1049	Pqc:	q_c
1050	Pqd:	q_d
1051	Pqs:	q_s
1052	Pqt:	q_t
1053	Pqu:	q_u
1054	Pq:	q
1055	PsDipm:	$D_{s1}(2536)^\pm$
1056	PsDm:	D_s^-
1057	PsDp:	D_s^+
1058	PsDst:	D_s^*