SASY Technical Note # 1

Writing Technical Notes Using LaTeX and PAW

M. Lucas

August 21, 1997
Version 1.0

1 Introduction

LaTeX is a typesetting program available on legsux2 and the VAXCluster. It's major appeal for our situation is its ability to include figures in a fairly simple manner. An additional strength is that it was originally designed to work with large documents, such as books or theses, whereas typical WYSIWYG editors may be a bit cumbersome when dealing with such an extended document. The LaTeX 'program' is actually a collection of macros which are executed by a program called TeX. LaTeXis meant to be an extra layer to TeXwhich makes the system easier to use by us mere mortals. Typically most typesetting projects can be performed without having to delve into the more involved world of TeX, but the power is there if needed.

This quick note is meant to give the briefest of introductions, giving enough information that one could create very simple notes which include both text and analysis figures. A recommended reference for further reading is the LaTeXUser's Guide and Reference Manual, by Leslie Lamport.

2 Creating a Simple LaTeX File

A LaTeX file is creating using a standard text editor. Typesetting directives are input using a collection of switches or flags, typically preceded by a backslash (\).

A sample file would look like this:

```
\documentclass[12pt]{article}
\begin{document}

A sample document in \LaTeX\ can be very simple.
```

```
Paragraphs are delineated by blank lines.
If several
very short lines are put
together, \LaTeX\ will combine them into a justified block of text.

\end{document}
```

The above text typesets into the following two paragraphs:

A sample document in LaTeX can be very simple.

Paragraphs are delineated by blank lines. If several very short lines are put together, LaTeX will combine them into a justified block of text.

In the article document class, one can include a title and author in the following format:

```
\title{XTAL Box Gain Matching}
\author{Mark Lucas}
\maketitle
```

The \maketitle command needs to be placed after the \begin{document} command. The author and title can be declared anywhere before the maketitle command.

3 Processing the Document

Once this document is created in the editor, you must run it through LaTeX. This will produce a DVI file (Device Independent). This file then needs to be translated for the specific output device. Most often this is a postscript file. A common translator in the public domain is `dvips`. The postscript file can then be previewed using a postscript previewer (such as `ghostview`) or printed directly to the printer. On legsux1, the procedure looks like this:

```
legsux1> latex sample
This is TeX, C Version 3.141
(sample.tex
LaTeX2e <1995/06/01> patch level 3
(/usr/local/lib/tex/inputs/article.cls
Document Class: article 1995/06/26 v1.3g Standard LaTeX document class
(/usr/local/lib/tex/inputs/size12.clo)) (sample.aux) [1] (sample.aux) )
Output written on sample.dvi (1 page, 452 bytes).
Transcript written on sample.log.
```

```
legsux1> dvips -o sample.ps sample
This is dvipsk 5.528a Copyright 1986, 1994 Radical Eye Software
' TeX output 1997.08.20:1058' -> sample.ps
<texc.pro>. [1]

legsux1> ghostview sample.ps
    ... preview postcript file ...

legsux1> qpr sample.ps
    ... print file on QMS ...
```

4 Adding a Figure

Figures can be added to the document quite easily using the `psfig` package. This package allows for the inclusion of encapsulated postscript file. Typically, the drawing will be placed into a figure which will float within the document. I typically use the following text to include a figure:

```
\begin{figure}[thbp]
\centerline{\psfig{figure=pbgls_wrap.eps,width=6.5in,silent=}}
\end{figure}
```

This will create a floating figure of the EPS file pbglas_wrap.eps. Width specifies the width to which the drawing should be scaled. The height will be scaled correspondingly. Likewise, one could give the height and have the width scaled. If the aspect ratio is does not need to be preserved, one can even select both.

Added trappings to a figure include a caption and a label. The caption provides text to be associated with the figure. The label provides a label which can be referenced for the figure number. This allows LaTeX to do the bookkeeping when referenced figures are shifted around in the document. The typical text would be:

```
\begin{figure}[thbp]
\centerline{\psfig{figure=pbgls_wrap.eps,width=6.5in,silent=}}
\caption{Pb Glass wrapping template showing holes and cuts.
\label{pbgls}}
\end{figure}

As can be seen in Figure \ref{pbgls}, the wrapping is ...
```

In order to use the package, several commands need to be placed at the top of the LaTeX file. These commands tell LaTeX to load the code for the psfig package, and then tell the package to include the full figure (there is a draft mode in which the package will only place a box in place of the figure). The document shell would then look like this:

```
\documentclass[12pt]{article}
\input{psfig.tex}
\psfull
\begin{document}

A sample document in \LaTeX\ can be very simple.

\begin{figure}[thbp]
\centerline{\psfig{figure=pbgls_wrap.eps,width=6.5in,silent=}}
\caption{Pb Glass wrapping template showing holes and cuts.
\label{pbgls}}
\end{document}
```

When processing the LaTeX file, the psfig package will check the size of the figure and leave the appropriate amount of space. The figure itself is not included in the document until it is converted into a postscript file using dvips. Unless the full path name for the EPS file is specified, the document needs to be typeset and converted (dvips) in the same directory, otherwise the EPS files will not be properly located.

5 Creating a Figure in PAW

PAW can create EPS as easily as it can create regular postscript. When a metafile is opened under PAW, the device code -113 is chosen instead of -112 or -111. This will then include the proper postscript trappings which allow the file to be included in another document (for example, the BOUNDINGBOX command, which tells other documents how large the figure is). Once the metafile is open, all graphical actions will be transmitted to the file as well as the screen. One thing to remember, an EPS file can only take one page worth of graphics. A new file needs to be opened for each page.

A simple KUMAC (KUIP MACRO) to create a figure would look like this:

```
macro fig_xtal_pi0

for/file 99 xtal_pi0.eps
meta 99 -113
```

```
zone 2 2
h/pl 101
h/pl 102
h/pl 103
h/pl 104

close 99
```

The hassles enter when creating figures that are reasonably scaled, have more appropriate fonts, and are well labelled. I have a collection of macros available that modify a number of the default options for plotting under PAW. Page 295 of the July 94 PAW manual shows some of these parameters, and the surrounding pages list the options and parameters.

```
macro dispfig33
*
*  PAW Display Initialization for ZONE 3 3
*
set xsiz 21; set ysiz 21        | set screen size in cm
set ygti .2; set gsiz .6        | set global title height and postion
set yhti .9; opt utit           | set user histogram titles
set ymgu 1.0; set ymgl 1.5      | set y margins for page
set xmgl 1.75; set xmgr 1.0     | set x margins for page
set ywin 1.25; set xwin 1.25    | set x and y spacing for histograms
set xval .2                     | set value spacing in X
set ylab .50; set xlab .70      | set label spacing

* Set fonts - Times Roman Postscript - for labels, values, etc ...
set lfon -130; set tfon -130; set vfon -130; set cfon -130; set gfon -130
igset txfp -130
set vsiz .15; set tsiz .20; set asiz .20 | set label sizes

opt nbox                        | no box around everything
zone 3 3                        | 3 by 3 zoning (9 histograms)

return
```

A typical histogram then requires the histogram itself, axis titles (`atitle` command), and some text labelling the histogram. For the latter, I use a macro called puttextfrac to place text at a certain relative position on the plot, regardless of the scale.

6 Tech Notes Style

The tech note style that I use is not truly a style in the sense of LaTeX. It is simply a file header that includes a file with the commands to make the header. This header includes the LEGS logo in EPS form. To use this format, copy the files legsart12.tex, legsstyle.tex, and legslogo.eps into the directory with the document (I actually create links to one set of files kept under lucas/doc/tech). The standard document frame now looks like this:

```
\include{legsstyle}
\techstart{Cosmic Rays and Pb Glass}{D. Pomarede and M. Lucas}
Write lots of junk about the thing which one is writing in this space.
\end{document}
```

LaTeXexamples can be found scattered throughout my directories. A good place to look is under /users/lucas/doc/tech on legsux1. Each tech note is placed in a separate directory.