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Merging LaTeX documents and PAW* graphics

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1 Introduction

The purpose of this note is to help LaTeX and PAW users to include figures created by PAW into a text created by LaTeX. The guide is applicable to the ALEPH Offline Cluster environment [1].

The user should be familiar with LaTeX and PAW in order to use the information in this note. An excellent guide for LaTeX is the book of reference [4]. A manual for PAW is available from the CERN Program Library [2].

2 Using LaTeX

One of the most popular typesetting systems in our HEP comunity is the TeX software package written initially by Donald E. Knuth [3]. This program allows high quality documents to be printed and previewed in graphics devices using as input a standart text file with appropiate TeX commands. In this note we refer to the LaTeX package, which is a collection of TeX macros.

*The Physics Analysis Program

[1] In other installations, please consult the appropiate guide. We assume a Postscript laser printer installed in the system and the use of the PSPRINT Software from Andrew Trevorrow [5]

The LaTeX program processes a text input file and creates a device independent output file (called usually a DVI file) which is translated to the appropiate device dependent printer language by a DVI driver. In the Aleph Offline Cluster the commands to run LaTeX and print the output are:

```
$ latex   preprint.tex
$ psprint preprint.dvi
```

The first command processes the file `preprint.tex` and creates a DVI file called `preprint.dvi`. The **psprint** command is a general purpose DVI translator to PostScript language which also sends the output file to the printer queue. For the IBM CERNVM, as an example, other commands should be used; consult [1] for details.

3 Using PAW

PAW is the implementation of the *Physics Analysis Workstation project* launched at CERN. The first public release became available early in 1988. PAW merges different old packages in order to have interactive graphical presentation of physics data from statistical analysis in the form of histogram plots (2D and 3D) and other useful graphics representations. PAW uses the GKS (Graphical Kernel System) graphics system which supports most of the graphical devices available at CERN such as Textronix, Falco terminals, Apollos, VAXStations, PostScript printers and others.

A manual is available from the CERN Program Library [2] and it is installed in the ALEPH Offline Cluster. To invoke a PAW session, the command:

```
$ PAW
```

is used.

The user can examine data graphically and print it in a high quality graphics device, in our case a PostScript laserprinter. The PAW program can generate either GKS metafiles or PostScript files. The latter can be generated, in the most simple way, with the following procedure:

```
PAW>FORTRAN/FILE 20 'FIG1.PS'
PAW>METAFILE     20 12201
PAW>...draw one figure...
PAW>METAFILE 0
PAW>CLOSE 20
```

The **fortran/file** commad creates a file called `fig1.ps` and assigns it to the logical unit 20, the **metafile** command assigns a GKS output channel to the unit 20 and defines it as a 12201 device (PostScript). When the **metafile** parameter is 0, the output file is dessasigned from GKS and the **close** command closes the output file `fig1.ps`.

The graphics output file created by PAW can be printed directly by the command,

```
$ psprint fig1.ps
```

Note that the origin of the drawing is in the left lower corner of the output page and if no paw commands have changed it, the size of the drawing is 20 x 20 cm.

4 Merging LaTeX and PAW

Once PAW figures are generated with the procedure explained above, they can be inserted in a LaTeX text as LaTeX figures, which can subsequently be referenced as any other figure. To do that, the first step is to eliminate a PostScript command from the PAW output file called **initgraphics**. This command resets the graphics origin to the lower left corner of the page, which may not be our intended position in the document to be produced. The most simple way to eliminate the command is to to edit the file and remove it. **The rest of the commands, even those generated in the same line should be kept in the file and saved.** Let us assume that the name of this file is `fig1.ps`. To insert the figure in file `fig1.ps` into the LaTeX file, a **figure** environment has to be defined. An example:

```
\begin{figure} [h]
  \vspace{13cm}
  \special{fig1.ps .65 .65 scale 0. 0. translate}
```

```
  \caption{This is a figure}
\end{figure}
```

In this example we have assumed a 20 x 20 drawing figure (default for PAW). The user can modify the size of the figure from PAW with the command,

```
PAW>/GRAPHICS/VIEWING/SIZE xsize ysize
```

The **vspace**, **scale** and **translate** parameters have to be changed accordingly (see example). Once we have all the figures in the draft paper, we proceed as usual,

```
$ latex   preprint.tex
$ psprint preprint.dvi
```

See page 7 of [5] for more tricks and details. This procedure should work also for other PostScript files not coming from PAW (care should be taken about the size!).

5 Example

In this section we show a practical example of merging PAW figures in a LaTeX document. The LaTeX file is called `test.tex`, the figure file is called `fig1.ps`. Remember to edit the picture file and remove the **initgraphics** command.

5.1 The LaTeX file

```
% File TEST.TEX written in LaTeX. A. Pacheco / June 1989
\documentstyle[12pt]{article}
\begin{document}
\title{Test of Merging \LaTeX\ and PAW figures}
\author{A. Pacheco}
\date{\today}
\maketitle
\section{Introduction}
```

```
\begin{quotation}
Abstract extracted from the lecture given at the
International School on the problems of the use of
the computers in physics, Dubna, 28 November to 3
December 1988 (DD/89/3) by M. Goosens
\end{quotation}

Over the last few years personal workstations with their good
response time, powerful graphics capabilities and attractive
user interface have begun to play an increasingly important
role in program development and interactive data analysis
and presentation. Large mainframes are used as centralised
CPU and file servers. Good communications between these
servers and the workstations are important to exploit their
full posibilities.
Also new tools adapted to this new highly integrated
environment are needed. At CERN the Physics Analysis
Workstation (PAW) programming system has been designed in
that spirit. It fully exploits the user friendliness and
interactive flexibilities of modern workstations. The PAW
system is available on many different software and hardware
configurations and its various components can be called
from applications running in batch as well as interactivelly.

%
% First PAW figure. Scale 1:1. Four plot drawing
%
\begin{figure} [h]
  \vspace{13cm}
  \special{fig1.ps .65 .65 scale 0 0 translate}
  \caption{Example of PAW plot (scale 1:1)}
\end{figure}
%
% Second PAW figure. Scale 1:2. The file is the same
% (fig1.ps), but VSPACE,SCALE and TRANSLATE commands
```

```
% have been changed.
%
\begin{figure} [h]
  \vspace{6.5cm}
  \special{fig1.ps .33 .33 scale 310 0 translate}
  \caption{Example of PAW plot (scale 1:2)}
\end{figure}
%
% Second PAW figure. Scale 1:3. The file is the same
% (fig1.ps), but VSPACE,SCALE and TRANSLATE commands
% have been changed.
%
\begin{figure} [h]
  \vspace{4.3cm}
  \special{fig1.ps .22 .22 scale 600 0 translate}
  \caption{Example of PAW plot (scale 1:3)}
\end{figure}
%
% *** Example of other POSTSCRIPT figures ***
%
% This is a figure from DALI (Aleph Display Program)
% It was created from a UIS metafile (Dali commands PR:BW:DO)
% The postscript translation was done with the command:
% $ RENDER/DEVICE=LN03R/NOFRAME/OUT=DALI.PS METAFILE.C1
% After this, the file DALI.PS has been edited in order
% to remove the commands SAVE, INITGRAPHICS from the
% start of the file and RESTORE and SHOWPAGE from the
% end of the file.
%
\begin{figure} [h]
  \vspace{18.0cm}
  \special{dali.ps 0.70 0.70 scale 0 0 translate}
  \caption{The first ALEPH Z0 event (landscape)}
\end{figure}
\end{document}
% End of Test.tex
```

5.2 The PAW commands

```
$ PAW
*********************************************************
*                                                       *
*            W E L C O M E    to   P A W                *
*                                                       *
*          Version 1.05/04  03 April  1989              *
*                                                       *
*********************************************************
Workstation type (?=HELP) <CR>=7878 :7878 for Falco terminals
                                     8601 for VAXStations
VERSION 7.4/2.6 OF GKSGRAL STARTED
*** Unknown file pawlogon.kumac
*** Unknown file disk$dl:[paw]pawsys.kumac
PAW>MESSAGE 'Creating file FIG1.PS'
Creating file FIG1.PS
PAW>FORTRAN/FILE 20 'FIG1.PS'
PAW>METAFILE 20 12201
PAW>VECTOR/CREATE V(10)
PAW>VECTOR/INPUT V 2 4 3 6 3 9 4 4 8 5
PAW>ZONE 2 2
PAW>VECTOR/DRAW V
PAW>VECTOR/DRAW V ! B
PAW>VECTOR/DRAW V ! L
PAW>VECTOR/DRAW V ! L*
PAW>METAFILE 0
PAW>CLOSE 20
PAW>EXIT
Exiting from PAW.
FORTRAN STOP
```

5.3 The VAX (DCL) commands

```
$ latex   test.tex
$ psprint test.tex
```

References

[1] Jurgen de Jonghe. *Using* LaTeX *on CERNVM.* Technical Report DD/US/121, CERN, 1988.

[2] René Brun et al. *PAW Users Guide.* CERN. CERN Program Library Q121.

[3] Donald E. Knuth. *The TeXbook.* Addison-Wesley Publishing Company, Massachusetts, 1984.

[4] Leslie Lamport. LaTeX*: A Document Preparation System.* Addison-Wesley Publishing Company, September 1986.

[5] Andrew Trevorrow. *PSPRINT User Guide.* August 1988. This manual is printable in the Aleph Offline Cluster. Type $ Help psprint for more details.

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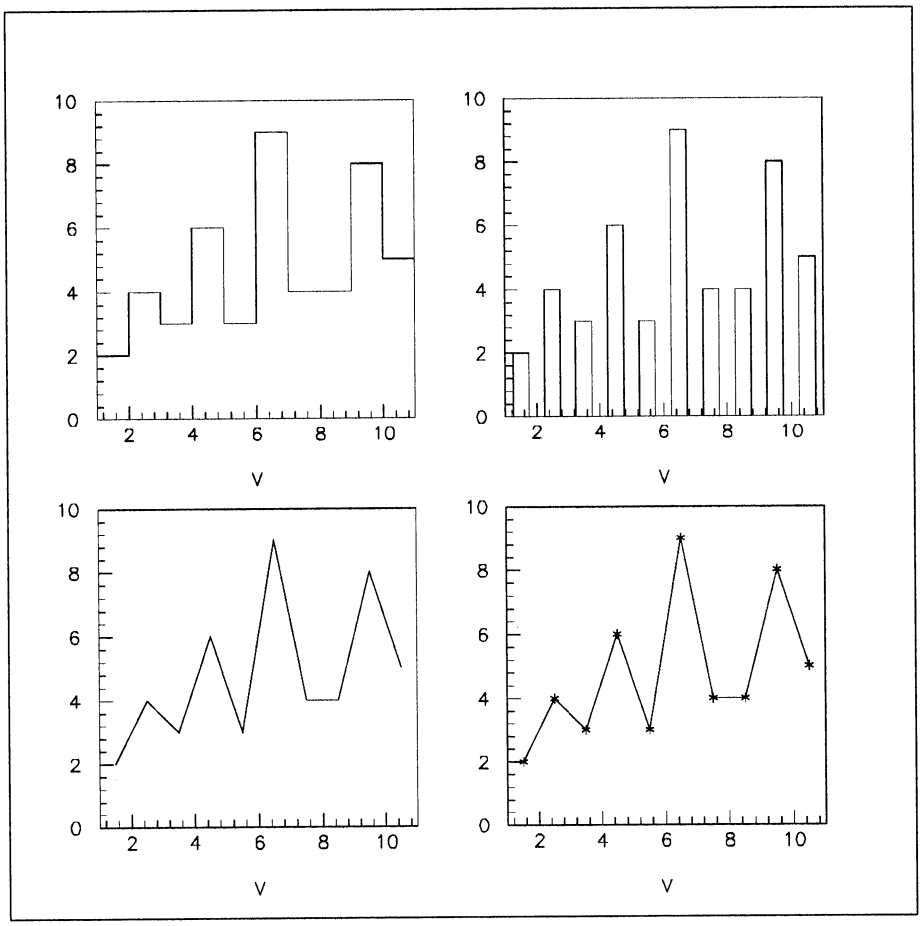

Figure 1: Example of PAW plot (scale 1:1)

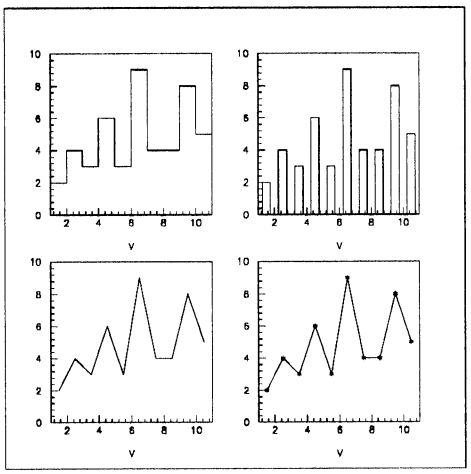

Figure 2: Example of PAW plot (scale 1:2)

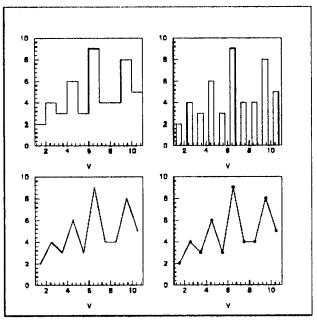

Figure 3: Example of PAW plot (scale 1:3)

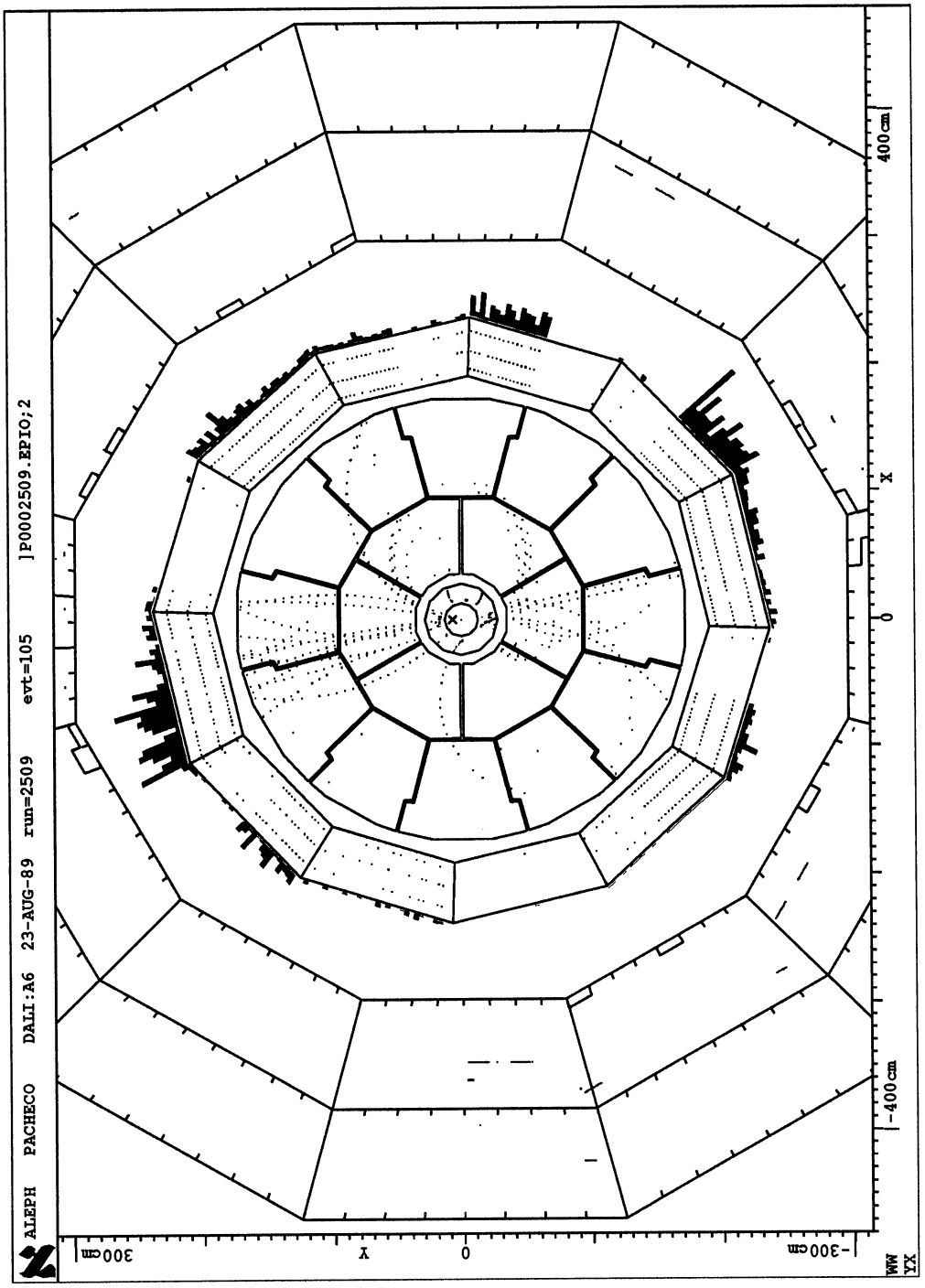

Figure 4: The first ALEPH Z0 event (landscape)