

# A plot package for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>\*

Jose-Emilio Vila-Forcen  
jemilio@ieee.org

2005/09/22

## Change History

v1.0 Emilio Vila-Forcen . . . . . 1  
General: Initial version by Jose-

## 1 Introduction

The functions described in the present document have been created to help in the drawing of plots from Matlab to L<sup>A</sup>T<sub>E</sub>X. The overall objective is to create a easy and fast framework to create plots with the same style, proper fonts, and just enough parameters.

## 2 Description

The package Startplot is composed of several functions. Due to the author's limited knowledge of T<sub>E</sub>X, it is done following L<sup>A</sup>T<sub>E</sub>X macros and the robustness of the package is not fully demonstrated.

All positions, total size of the figure and so on are calculated automatically using package FP.

### 2.1 Definition of an especific style

`\MPbg` Some functions are provided to change the style of the plots: Execute `\MPbg` it in order to use black lines with different styles already predefined. It is by default

`\MPcolor` Execute `\MPcolor` it in order to use solid color lines already predefined. It can be selected using the `color` package option or executing the command.

`colorLine[ABCDEFGF]` If you want to change the colors of the lines, you may change one by one redefining the colors. For example:

---

\*This file has version number v1.0, last revised 2005/09/22.

`\definecolor{colorLineA}{rgb}{1,1,1}`

`\styleofLine[ABCDEFGH]`

It is possible to modify the seven predefined styles one by one: simply recreate a new definition for the desired one(s).

Font commands

The commands `\fontaxeX`, `\fontaxeY`, `\fonttitleX`, `\fonttitleY` and `\fontlegend` contains the definitions of the fonts used in different parts of the legend: axes, labels (or titles) and legend. You may change them as, for example:

`\def\fontaxeY{\small}`

`\defaultOptionsMakeplot`

The `\defaultOptionsMakeplot` command is executed at the beginning of the definition of the plot. redefine it to your desired code if you need to execute something more for each picture.

## 2.2 Create the plot

The plot is composed of several orders consecutive. Besides the order described here, a lot of them exist in the file which obtain the same result, but using more input parameters. The ones that I describe here are enough for the most of the cases.

makeplot

The `makeplot` environment is the starting point to create the plot. The command line is as follows:

`\begin{makeplot}[\langle keys \rangle]{\langle legend in Y \rangle}{\langle legend in X \rangle} ..... \end{makeplot}`

The optional arguments are the keys from PsTricks, including the ones for `\psaxes` function. Also, some new keys are added:

**Dx** Distance between labels in X

**Dy** Distance between labels in Y

**width** Width of the plot in mm

**heightFactor** Factor of height length respect to the width

**startX** Minimum value in the axis X

**startY** Minimum value in the axis Y

**endX** Maximum value in the axis X

**endY** Maximum value in the axis Y

**factorBoundaryX** Separation to the border

**factorBoundaryY** Separation to the border

**captionX** Separation to the caption in X, over 100

**captionY** Separation to the caption in Y, over 100

**changeEndXpos** If it is needed to change the end of the axis X, because of external legend (yes or no)

**changeEndXsize** How many mm more than the estandard

**tickyplot** Special ticks (all, x, y, none)

**drawmargins** Draw margins in this figure (there exist an option in the package to do it globally)

**orgX and orgY** Not working properly, intended to change the origin of the graphic

For example, a typical configuration for semilog case it is to use the options:

ylogBase=10, logLines=y, subticks=10, xsubticks=1

**\makeplot** The **\makeplot** macro works as the environment, but once the plot is finished it is needed to write **\end{pspicture}**

## 2.3 Plotting the data from files

**\plotFile** The **\plotFile\oarg{keys}\marg{file}** macro takes the data from a file and plot it using the existing properties for lines in PsTricks taking into account the optional keys given to the command.

**\plotFile[ABCDEFGF]** These macros have the same configuration as **\plotFile**, but each one uses the line style predefined.

## 2.4 The legend

The **makeplot** package can do very nice legends and without effort. There exists the next keys to control the apearence of the legend:

**fillcolorWhiteBG** Select the color name for the background of the legend

**fillstyleWhiteBG** Select the fillstyle for the background of the legend

**framearcWhiteBG** dimension of the arc of the legend box

**linewidthWhiteBG** linewidth of the legend box

**linestyleWhiteBG** linestyle of the legend box

**linecolorWhiteBG** color of the line of the legend box

and

**legendSep** Separation between legends in vertical

**lineLength** Length of the line in the legend area

**lineTextSep** Separation between the line and the text

**borderlineSep** Separation from the border of the box to the line

The main commands are as follows:

`\legendXY` The `\legendXY` macro usage is as follows:

```
\legendXY[<keys>](<coordinate X,coordinate Y>){<number of lines to  
be in the legend>}{<width in mm>}
```

`\legend[DL,DR,UL,UR]` These macros avoid the needed to specify a coordinate and draw the legend in the position down-left, down-right, up-left or up-right of the plot. Therefore, the syntax is:

```
\legendDL[<keys>]{<number of lines to be in the legend>}{<width in  
mm>}
```

### 3 Record proper Matlab data

Matlab is one of the most famous data processing software in the research community. Because of its simplicity, the generation of the needed files can be done easily after their generation.

Each plot should be saved in a separate file in ASCII format. Thus, follow the next process for each one of the lines to plot:

1. Create a matrix Nx2, where N denotes the dimensionality of the data. Put in the first column the data of the X-axis, and in the second one the values in the Y-axis corresponding to the previous X one, let's call this matrix *values*;
2. Save *values* in a file as follows: `save file.mat values -ascii`.

#### Remarks

- Editing in a text editor should be possible, and numbers should be visible in ASCII format;
- The data should be real;
- It is possible to comment values in the file with %;
- It is possible to modify manually the values in the file.

### 4 Create EPS files

It is possible to create EPS files and use them directly in latex. The benefits are faster compilation and it is always good to have them in separate files, for example for distribution.

In order to create EPS files, follow the procedure:

1. Install perl from [www.perl.com](http://www.perl.com);

2. Copy bbox.exe from ps2eps.zip file to c:\texmf\miktex\bin. ps2eps.zip can be found at  
[www.telematik.informatik.uni-karlsruhe.de/~bless/ps2eps.html](http://www.telematik.informatik.uni-karlsruhe.de/~bless/ps2eps.html);
3. SET PATHEXT=.pl;%PATHEXT% or use the start, settings, control panel, system, advanced tab, environment variables and edit the PATHEXT entry accordingly;
4. Rename ps2eps to ps2eps.pl and copy it to c:\texmf\miktex\bin.

Now, we create a batch file to help in the compilation of each time: Create a bat file something like: `makefigure.bat`, save it in c:\texmf\miktex\bin. It should contain the following lines:

```
echo off
del figures/%1.eps
latex %1eps.tex
dvips -t a4 -P pdf %1eps.dvi
ps2eps.pl %1eps.ps %1eps.eps
del %1eps.ps
del %1eps.eps
mkdir figures
rename %1eps.eps.eps %1.eps
move %1.eps figures
```

It is possible to change the contain above for different file names. In my case, I am creating files are follows:

```
\input{headers.tex}
\begin{document}
\pagestyle{empty}
\input{fig1.tex}
\end{document}
```

with the name `NAMEeps.tex` where `NAME` can be changed to the desired name. The file `headers.tex` contains all the headers of my report and therefore all proper fonts and so on will be used in this file and in the general one.

To create this file, it is possible to make another batch file called `fileForEPS.bat` such that:

```
echo off
echo \input{headers.tex} \begin{document} \emph{(continue in the same line)}
\pagestyle{empty} \input{%1.tex} \end{document} > %1eps.tex
```

Execute `makefigure NAME` in the proper directory, and the EPS picture file will be created in the directory `figures/`. If you need to create the additional tex file, execute `fileForEPS NAME` and it will be done.

The procedure described above allows to use the following code in the main file:

```
\begin{figure}  
\centering  
%\input{fig.tex}  
\includegraphics{figure/fig.eps}  
\caption{Caption of the figure}  
\label{fig:fig}  
\end{figure}
```

where the commented line will describe which file is used: it is possible to choose between the tex file or (once picture is fixed and in order to improve speed) the eps one.

## 5 An example file

```
1 <*mpptest>
2 \documentclass[]{article}
3 \usepackage[color]{makeplot}
4 \begin{document}
5 \begin{figure}
6 \centering
7
8 \begin{makeplot}[startX=-10, endX=5, startY=-1, endY=0, Dx = 5,%
9   width=40, heightFactor=1, %
10  ylogBase=10, logLines=y, subticks=10, xsubticks=1]%
11  {$P_e$}{WNR, [dB]}
12 \plotFileA[xEnd=0,nStep=10]{data1.mat}
13 \plotFileB[xEnd=2]{data2.mat}
14 \legendDL{24.5}{2}
15 \legendAf{UDQ-QIM}
16 \legendBf{UQ-QIM}
17 \end{makeplot}
18
19 \caption{Performance analysis result.}
20 \label{fig:results}
21 \end{figure}
22
23 \end{document}
24 </mpptest>
```

### 5.1 Data files:

#### data1.mat

```
25 <*data1>
26 -1.0000000e+001 -3.1186120e-001
27 -9.5000000e+000 -3.1382220e-001
28 -9.0000000e+000 -3.1610308e-001
29 -8.5000000e+000 -3.1874224e-001
30 -8.0000000e+000 -3.2177814e-001
31 -7.5000000e+000 -3.2524775e-001
32 -7.0000000e+000 -3.2918480e-001
33 -6.5000000e+000 -3.3361772e-001
34 -6.0000000e+000 -3.3856759e-001
35 -5.5000000e+000 -3.4404614e-001
36 -5.0000000e+000 -3.5005399e-001
37 -4.5000000e+000 -3.5657933e-001
38 -4.0000000e+000 -3.6359717e-001
39 -3.5000000e+000 -3.7106902e-001
40 -3.0000000e+000 -3.7894319e-001
41 -2.5000000e+000 -3.8715537e-001
42 -2.0000000e+000 -3.9562939e-001
43 -1.5000000e+000 -4.0427825e-001
44 -1.0000000e+000 -4.1300527e-001
```

```

45 -5.0000000e-001 -4.2170561e-001
46 0.0000000e+000 -4.3026847e-001
47 5.0000000e-001 -4.5284882e-001
48 1.0000000e+000 -4.8524584e-001
49 1.5000000e+000 -5.2154969e-001
50 2.0000000e+000 -5.6193985e-001
51 2.5000000e+000 -6.0664420e-001
52 3.0000000e+000 -6.5595407e-001
53 3.5000000e+000 -7.1023618e-001
54 4.0000000e+000 -7.6994081e-001
55 4.5000000e+000 -8.3560655e-001
56 5.0000000e+000 -9.0786295e-001
57 </data1>

```

## data2.mat

```

58 (*data2)
59 -1.0000000e+001 -3.0170171e-001
60 -9.5000000e+000 -3.0182275e-001
61 -9.0000000e+000 -3.0197731e-001
62 -8.5000000e+000 -3.0217679e-001
63 -8.0000000e+000 -3.0243768e-001
64 -7.5000000e+000 -3.0278484e-001
65 -7.0000000e+000 -3.0325664e-001
66 -6.5000000e+000 -3.0391260e-001
67 -6.0000000e+000 -3.0484295e-001
68 -5.5000000e+000 -3.0617875e-001
69 -5.0000000e+000 -3.0809964e-001
70 -4.5000000e+000 -3.1083660e-001
71 -4.0000000e+000 -3.1466753e-001
72 -3.5000000e+000 -3.1990577e-001
73 -3.0000000e+000 -3.2688343e-001
74 -2.5000000e+000 -3.3593295e-001
75 -2.0000000e+000 -3.4737023e-001
76 -1.5000000e+000 -3.6148225e-001
77 -1.0000000e+000 -3.7852034e-001
78 -5.0000000e-001 -3.9869936e-001
79 0.0000000e+000 -4.2220206e-001
80 5.0000000e-001 -4.4918738e-001
81 1.0000000e+000 -4.7980138e-001
82 1.5000000e+000 -5.1418989e-001
83 2.0000000e+000 -5.5251165e-001
84 2.5000000e+000 -5.9495142e-001
85 3.0000000e+000 -6.4173231e-001
86 3.5000000e+000 -6.9312654e-001
87 4.0000000e+000 -7.4946429e-001
88 4.5000000e+000 -8.1114012e-001
89 5.0000000e+000 -8.7861718e-001
90 </data2>

```



## 6 The implementation

91 `\makeplot`

There exist some different ways to write the legends into the box. The easiest one is to use the next commands:

`\legend[ABCDEFGF]` These macros write the legends into the box in the order of the tex source. Each one has a different line style as it was for the plot. The syntax is:

`\legendCf[keys]{text}`

where the keys might modify the line style.

`\legendText` The `\legendText` macro includes some text in the legend without a line:

`\legendText[keys]{text}`

where the keys are not used, but kept in the definition of the macro for paralelism.

### 6.1 Headers

First we test that we got the right format and name the package, and load external packages.

```
92 \NeedsTeXFormat{LaTeX2e}%
93 \ProvidesPackage{makeplot}[2005/09/22 %
94                               v1.0 %
95                               Plots utility from Jose-Emilio Vila-Forcen]%
96 \RequirePackage[nomessages]{fp}%
97 \RequirePackage{pst-plot}%
98 \RequirePackage{pstricks-add}%
99 \RequirePackage{xkeyval}%
```

`color` The option `color` leads to a redefinition of the line styles of the plot and uses colors with solid lines. Otherwise, black lines with different line styles are used

```
100 \newif\ifMP@color%
101 \MP@colorfalse%
102 \DeclareOption{color}{%
103   \MP@colortrue%
104   \typeout{ -----}%
105   \typeout{ ----- startPlot package working in color}%
106   \typeout{ -----}}%
```

`drawmargins` The option `drawmargins` draw the margins of the figures. This option is useful in order to check if something is going out of the margins, since there is not internal checking for that.

```
107 \newif\ifMP@drawmargins%
108 \MP@drawmarginfalse%
109 \DeclareOption{drawmargins}{%
110   \MP@drawmargintrue%
111   \typeout{ -----}%
112   \typeout{ ----- startPlot package drawing the margins}%
113   \typeout{ -----}}%
```

If an unknown option is used, a warning will be displayed.

```

114 \DeclareOption*{%
115   \PackageWarning{startPlot}{%
116     Unknown option '\CurrentOption'}}%
    Now we process the options.
117 \ProcessOptions\relax%
```

## 6.2 Commands to fix the style

**\MPbg** Command to use the styles of the lines in black and white, by default:

```

118 \newcommand{\MPbg}{%
119   \def\styleoflineA{%
120     \psset{linestyle=solid, dash=1pt 0pt 0pt 0pt, dotsep=0pt,%
121       color=black}}%
122   \def\styleoflineB{%
123     \psset{linestyle=dashed, dash=5pt 5pt 0pt 0pt, dotsep=0pt,%
124       color=black}}%
125   \def\styleoflineC{%
126     \psset{linestyle=dotted, dash=3pt 2pt 0pt 0pt, dotsep=1pt,%
127       color=black}}%
128   \def\styleoflineD{%
129     \psset{linestyle=dashed, dash=4pt 1.5pt 1pt 1.5pt, dotsep=3pt,%
130       color=black}}%
131   \def\styleoflineE{%
132     \psset{linestyle=dotted, dash=1pt 4pt 0pt 0pt, dotsep=3pt,%
133       color=black}}%
134   \def\styleoflineF{%
135     \psset{linestyle=dashed, dash=6pt 1.5pt 3pt 1.5pt, dotsep=3pt,%
136       color=black}}%
137   \def\styleoflineG{%
138     \psset{linestyle=dashed, dash=2pt 6pt 0pt 0pt, dotsep=0pt,%
139       color=black}}}%
140
```

**MPcolor** Definition of the standard colors for the lines, using the color option of the package. They might be changed by the user:

```

140 \definecolor{colorLineA}{rgb}{0,0,1}%
141 \definecolor{colorLineB}{rgb}{1,0,0}%
142 \definecolor{colorLineC}{rgb}{0,1,0}%
143 \definecolor{colorLineD}{rgb}{0,1,1}%
144 \definecolor{colorLineE}{rgb}{1,0,1}%
145 \definecolor{colorLineF}{rgb}{1,1,0}%
146 \definecolor{colorLineG}{rgb}{0.5,0.5,0.5}%
147
```

Command to set the styles of the lines using colors:

```

147 \newcommand{\MPcolor}{%
148   \def\styleoflineA{\psset{linestyle=solid, linecolor=colorLineA}}%
149   \def\styleoflineB{\psset{linestyle=solid, linecolor=colorLineB}}%
150   \def\styleoflineC{\psset{linestyle=solid, linecolor=colorLineC}}%
151   \def\styleoflineD{\psset{linestyle=solid, linecolor=colorLineD}}%
152
```

```

152 \def\styleoflineE{\psset{linestyle=solid, linecolor=colorLineE}}%
153 \def\styleoflineF{\psset{linestyle=solid, linecolor=colorLineF}}%
154 \def\styleoflineG{\psset{linestyle=solid, linecolor=colorLineG}}%

```

According to the package option, one of the styles will be loaded:

```

155 \ifMP@color%
156 \MPcolor%
157 \else%
158 \MPbg%
159 \fi%
160 \makeatletter%

```

**Font sizes** Definition of the standard font sizes in the plot. It is possible to redefine them.

```

161 \def\fontaxeY{\normalsize}%
162 \def\fontaxeX{\normalsize}%
163 \def\fonttitleY{\normalsize}%
164 \def\fonttitleX{\normalsize}%
165 \def\fontlegend{\footnotesize}%

```

## 6.3 Main macros: makeplot

Options for the command `makeplot` and the addition of the family of keys.

```

166 \define@key[psset]{makeplot}{Dx}[1]%
167   {\def\gridDxmakeplot{#1}}%
168 \define@key[psset]{makeplot}{Dy}[1]%
169   {\def\gridDymakeplot{#1}}%
170 \define@key[psset]{makeplot}{width}[50]%
171   {\def\widthPlotmakeplot{#1}}%
172 \define@key[psset]{makeplot}{heightFactor}[1]%
173   {\def\heightPlotFactormakeplot{#1}}%
174 \define@key[psset]{makeplot}{startX}[0]%
175   {\def\xmakeplot{#1}}%
176 \define@key[psset]{makeplot}{startY}[0]%
177   {\def\ymakeplot{#1}}%
178 \define@key[psset]{makeplot}{endX}[1]%
179   {\def\xzmakeplot{#1}}%
180 \define@key[psset]{makeplot}{endY}[1]%
181   {\FPmul\yzmakeplot{#1}{1.0001}}%
182 \define@key[psset]{makeplot}{factorBoundaryX}%
183   {\FPdiv\factorBOUNDARYxmakeplot{#1}{1.5}}%
184 \define@key[psset]{makeplot}{factorBoundaryY}%
185   {\FPdiv\factorBOUNDARYymakeplot{#1}{1.5}}%
186 \define@key[psset]{makeplot}{captionY}%
187   {\FPdiv\factorXmakeplot{#1}{8}}%
188 \define@key[psset]{makeplot}{captionX}%
189   {\FPdiv\factorYmakeplot{#1}{11}}%
190 \define@choicekey[psset]{makeplot}{changeEndXpos}[\var\nr]{no,yes}%
191   {\def\endXmakeplot{\nr}}%

```

```

192 \define@key[psset]{makeplot}{changeEndXsize}%
193     {\def\endXbmakeplot{#1}}%
194 \define@choicekey[psset]{makeplot}{tickypoint}[\val\nr]{all,x,y,none}%
195     {\def\tickymakeplot{\nr}} %
196 \define@choicekey[psset]{makeplot}{drawmargins}[\vall\nrr]{yes,no}%
197     {\def\drawmarginsmakeplot{\nrr}} %
198 \define@key[psset]{makeplot}{orgX}%
199     {\def\orgXmakeplot{#1}} %
200 \define@key[psset]{makeplot}{orgY}%
201     {\def\orgYmakeplot{#1}} %
202 \pst@addfams{makeplot}%

```

Default values for the above parameters

```

203 \psset{linewidth=0.5pt, Dx=1, Dy=1,%
204 width=50, heightFactor=1, startX=0, endX=1, startY=0, endY=1,%
205 showorigin=true, axesstyle=frame, ticks=all, labels=all, %
206 factorBoundaryX=1, factorBoundaryY=1, captionY=100, captionX=100, %
207 xsubticks=0, subticksize=1, tickwidth=0.2pt, subtickwidth=0.2pt, %
208 subtickcolor=black}%
209 \psset{tickypoint=all}%
210 \psset{changeEndXsize=0, changeEndXpos=no}%
211 \ifMP@drawmargins%
212 \psset{drawmargins=yes}%
213 \else%
214 \psset{drawmargins=no}%
215 \fi%
216 \psset{orgX=314, orgY=314}%

```

**makeplot** The `makeplot` environment performs most of the tasks needed for the plot. The axes are drawn, the legends and everything related with the background of the plot besides the legend, that will arrive later.

```

217 \newenvironment{makeplot}[3]{}%
218     {\makeplot{#1}{#2}{#3}}%
219     {\end{pspicture}}%

```

**\defaultOptionsMakeplot** Default values, it is possible to change this command as desired to include some source to be executed in each `makeplot` command or environment call

```

220 \def\defaultOptionsMakeplot{}%

```

**\makeplot** This is the most important macro, it can be used instead of the `makeplot` environment just adding `\end{pspicture}` at the end of the plot.

```

221 \def\makeplot{\@ifnextchar[\@makeplot{\@makeplot[]}}%
222 \def\@makeplot[#1]#2#3{%
223     % Use the default options command and process
224     % the options of the command line
225     \defaultOptionsMakeplot%
226     \psset{#1}%
227     % Calculate the dimensions of the plot
228     \def\gridDx{\gridDxmakeplot}%

```

```

229 \def\gridDy{\gridDymakeplot}%
230 \def\widthPlot{\widthPlotmakeplot}%
231 \def\heightPlotFactor{\heightPlotFactormakeplot}%
232 \def\xa{\xamakeplot}%
233 \def\ya{\yamakeplot}%
234 \def\xz{\xzmakeplot}%
235 \def\yz{\yzmakeplot}%
236 \def\factorBOUNDARYx{\factorBOUNDARYxmakeplot}%
237 \def\factorBOUNDARYy{\factorBOUNDARYymakeplot}%
238 \def\factorX{\factorXmakeplot}%
239 \def\factorY{\factorYmakeplot}%
240 \def\endXa{\endXamakeplot}%
241 \def\endXb{\endXbmakeplot}%
242 \def\ticky{\tickymakeplot}%
243 \def\drawmargins{\drawmarginsmakeplot}%
244 \def\orgX{\orgXmakeplot}%
245 \def\orgY{\orgYmakeplot}%
246 %
247 % Use the fonts established
248 \def\pshlabel{\fontaxeX}%
249 \def\psvlabel{\fontaxeY}%
250 \def\pshlabel{\fontaxeX}%
251 \def\psvlabel{\fontaxeY}%
252 %
253 % Calculate the proper units for the plot
254 \FPadd\xDiff\xz{-\xa}%
255 \FPdiv\unitX\widthPlot\xDiff%
256 \FPadd\yDiff\yz{-\ya}%
257 \FPMul\ff\widthPlot\heightPlotFactor%
258 \FPdiv\unitY\ff\yDiff%
259 \psset{xunit=\unitX mm,yunit=\unitY mm}%
260 %
261 \FPadd\yinc\yz{-\ya}%
262 \FPdiv\ymid\yinc{2}%
263 \FPadd\ymid\ymid\ya%
264 \FPadd\xinc\xz{-\xa}%
265 \FPdiv\xmid\xinc{2}%
266 \FPadd\xmid\xmid\xa%
267 \FPadd\xzz\xz{0}%
268 %
269 % Related to the position of the legends
270 \FPdiv\factorX\factorX\unitX%
271 \FPadd\xaa\xz{-\factorX}%
272 \FPdiv\factorY\factorY\unitY%
273 \FPadd\yaa\yz{-\factorY}%
274 %
275 % Related to the size of the plot
276 \FPdiv\factorBOUNDARYx\factorBOUNDARYx\unitX%
277 \FPadd\xaaa\xaa{-\factorBOUNDARYx}%
278 \FPdiv\factorBOUNDARYy\factorBOUNDARYy\unitY%

```

```

279 \FPadd\yaaa\yaa{-\factorBOUNDARYy}%
280 %
281 % Change of the size of the plot
282 % if it is asked in the options,
283 % like putting the legend at the right
284 \ifnum \endXb>0%
285   \FPdiv\w{\endXb}\unitX%
286   \ifnum \endXa=0%
287     \def\endXa{\xz}%
288   \fi%
289   \FPadd\ww{\endXa}{-\xz}%
290   \def\sep{0.5}%
291   \FPdiv\www\sep\unitX%
292   \FPadd\xzz\xz\w%
293   \FPadd\xzz\xzz\ww%
294   \FPadd\xzz\xzz\www %
295 \fi%
296 %
297 % Starting the pspicture environment
298 \begin{pspicture}(\xaaa,\yaaa)(\xzz,\yz)%
299 %
300 % Draw a box with the margins if requested
301 \ifnum \drawmargins=0%
302   \psframe(\xaaa,\yaaa)(\xzz,\yz)%
303 \fi%
304 %
305 \FPadd\tickHerex{\yz}{-\ya}%
306 \FPMul\tickHerex\tickHerex\unitY%
307 \FPadd\tickHerey{\xz}{-\xa}%
308 \FPMul\tickHerey\tickHerey\unitX%
309 %
310 % To change the origin of the plot
311 % not working yet
312 \def\xAOrigin{\xa}%
313 \def\yAOrigin{\ya}%
314 \ifnum \orgX=314%
315   \else%
316     \def\xAOrigin{\orgX}%
317   \fi%
318 \ifnum \orgY=314%
319   \else%
320     \def\yAOrigin{\orgY}%
321   \fi %
322 %
323 % Put the ticks as given in the options
324 \ifnum \ticky=0%
325   \psaxes[Ox=\xa,Oy=\ya,Dx=\gridDx,Dy=\gridDy, #1,%
326     ticksize=-4pt 4pt, subticks=0, subticksize=0,%
327     tickwidth=0.5pt, linewidth=0pt, labels=none,%
328     axesstyle=axes, linecolor=white, #1, ticks=all]%

```

```

329      {-}(\xa,\ya)(\xa,\ya)(\xz,\yz)%
330 \fi%
331 \ifnum \ticky=1%
332   \psaxes[Ox=\xa,Oy=\ya,Dx=\gridDx,Dy=\gridDy, #1,%
333     ticksize=-4pt 4pt, subticks=0, subticksize=0,%
334     tickwidth=0.5pt, linewidth=0pt, labels=none,%
335     axesstyle=axes, linecolor=white, #1, ticks=x]%
336   {-}(\xa,\ya)(\xa,\ya)(\xz,\yz)%
337 \fi%
338 \ifnum \ticky=2%
339   \psaxes[Ox=\xa,Oy=\ya,Dx=\gridDx,Dy=\gridDy, #1,%
340     ticksize=-4pt 4pt, subticks=0, subticksize=0,%
341     tickwidth=0.5pt, linewidth=0pt, labels=none,%
342     axesstyle=axes, linecolor=white, #1, ticks=y]%
343   {-}(\xa,\ya)(\xa,\ya)(\xz,\yz)%
344 \fi%
345 \ifnum \ticky=3%
346   \psset{ticks=none}%
347 \fi%
348 %
349 % Put the main axes and the grid
350 \psaxes[xticksize=0pt \tickHere x mm, yticksize=0pt \tickHere y mm,%
351   Ox=\xa,Oy=\ya,Dx=\gridDx,Dy=\gridDy, #1]%
352   {-}(\xaOrigin,\yaOrigin)(\xa,\ya)(\xz,\yz)%
353 %
354 % Write the legend of the plot
355 \rput(\xaa,\ymid){\rotateleft{\fonttitleY #2}}%
356 \rput(\xmid,\yaa){\fonttitleX #3}%
357 \psset{linewidth=1pt}%
358 }%

```

## 6.4 How to plot the data of a file

`\plotFile` Function to plot a file with the linestyle given

```

359 \def\plotFile{\@ifnextchar[\@plotFile{\@plotFile[]}}%
360 \def\@plotFile[#1]#2{%
361   \readdata{\data}{#2}\dataplot[#1]{\data}}%

```

And now, a specific function for each linestyle predefined:

`\plotFileA`

```

362 \def\plotFileA{\@ifnextchar[\@plotFileA{\@plotFileA[]}}%
363 \def\@plotFileA[#1]#2{%
364   \styleofflineA%
365   \plotFile[#1]{#2}}%

```

`\plotFileB`

```

366 \def\plotFileB{\@ifnextchar[\@plotFileB{\@plotFileB[]}}%
367 \def\@plotFileB[#1]#2{%

```

```

368 \styleofflineB%
369 \plotFile[#1]{#2}}%

\plotFileC
370 \def\plotFileC{\@ifnextchar[\@plotFileC{\@plotFileC[]}}%
371 \def\@plotFileC[#1]#2{%
372 \styleofflineC%
373 \plotFile[#1]{#2}}%

\plotFileD
374 \def\plotFileD{\@ifnextchar[\@plotFileD{\@plotFileD[]}}%
375 \def\@plotFileD[#1]#2{%
376 \styleofflineD%
377 \plotFile[#1]{#2}}%

\plotFileE
378 \def\plotFileE{\@ifnextchar[\@plotFileE{\@plotFileE[]}}%
379 \def\@plotFileE[#1]#2{%
380 \styleofflineE%
381 \plotFile[#1]{#2}}%

\plotFileF
382 \def\plotFileF{\@ifnextchar[\@plotFileF{\@plotFileF[]}}%
383 \def\@plotFileF[#1]#2{%
384 \styleofflineF%
385 \plotFile[#1]{#2}}%

\plotFileG
386 \def\plotFileG{\@ifnextchar[\@plotFileG{\@plotFileG[]}}%
387 \def\@plotFileG[#1]#2{%
388 \styleofflineG%
389 \plotFile[#1]{#2}}%

```

## 6.5 Legends code

**\legend** Defines the general **\legend** command, the inputs are: the optional parameter with PSTricks keys, the position in X, the length of the line, the separation between line and text, the position in Y and the text of the legend.

```

390 \def\legend{\@ifnextchar[\@legend{\@legendf[]}}%
391 \def\@legend[#1]#2#3#4#5#6{%
392 \def\xb{#2}%
393 \def\x{#3}%
394 \FPdiv\x\x\unitX%
395 \FPadd\xbb\x\x%
396 \def\x{#4}%
397 \FPdiv\x\x\unitX%
398 \FPadd\xc\xbb\x%
399 %

```



```

400 \def\y{#5}%
401 \psline[#1]{-}(\xb,\y)(\xbb,\y)%
402 \rput(\xc,\y){\makebox[0 cm][l]{\fontlegend #6}}}%

```

`\legend[ABCDEFGF]` One command for each line style: as the previous command, but now using the predefined styles

```

403 \def\legendA{\@ifnextchar[\@legendA{\@legendA[]}}%
404 \def\@legendA[#1]#2#3#4#5{%
405   \styleofflineA%
406   \legend[#1]{#2}{#3}{#4}{#5}}%
407 \def\legendB{\@ifnextchar[\@legendB{\@legendB[]}}%
408 \def\@legendB[#1]#2#3#4#5{%
409   \styleofflineB%
410   \legend[#1]{#2}{#3}{#4}{#5}}%
411 \def\legendC{\@ifnextchar[\@legendC{\@legendC[]}}%
412 \def\@legendC[#1]#2#3#4#5{%
413   \styleofflineC%
414   \legend[#1]{#2}{#3}{#4}{#5}}%
415 \def\legendD{\@ifnextchar[\@legendD{\@legendD[]}}%
416 \def\@legendD[#1]#2#3#4#5{%
417   \styleofflineD%
418   \legend[#1]{#2}{#3}{#4}{#5}}%
419 \def\legendE{\@ifnextchar[\@legendE{\@legendE[]}}%
420 \def\@legendE[#1]#2#3#4#5{%
421   \styleofflineE%
422   \legend[#1]{#2}{#3}{#4}{#5}}%
423 \def\legendF{\@ifnextchar[\@legendF{\@legendF[]}}%
424 \def\@legendF[#1]#2#3#4#5{%
425   \styleofflineF%
426   \legend[#1]{#2}{#3}{#4}{#5}}%
427 \def\legendG{\@ifnextchar[\@legendG{\@legendG[]}}%
428 \def\@legendG[#1]#2#3#4#5{%
429   \styleofflineG%
430   \legend[#1]{#2}{#3}{#4}{#5}}%

```

`\legend[ABCDEFGF]f` An automatic legend mode, where the position is automatically calculated for each one in consecutive order

```

431 \def\legendAf{\@ifnextchar[\@legendAf{\@legendAf[]}}%
432 \def\@legendAf[#1]#2{%
433   \legendA[#1]{\posx}{\l}{\s}{\posy}{#2}%
434   \FPadd\posy\posy{-\dif}}%
435 \def\legendBf{\@ifnextchar[\@legendBf{\@legendBf[]}}%
436 \def\@legendBf[#1]#2{%
437   \legendB[#1]{\posx}{\l}{\s}{\posy}{#2}%
438   \FPadd\posy\posy{-\dif}}%
439 \def\legendCf{\@ifnextchar[\@legendCf{\@legendCf[]}}%
440 \def\@legendCf[#1]#2{%
441   \legendC[#1]{\posx}{\l}{\s}{\posy}{#2}%
442   \FPadd\posy\posy{-\dif}}%

```

```

443 \def\legendDf{\@ifnextchar[\@legendDf{\@legendDf []}}%
444 \def\@legendDf[#1]#2{%
445   \legendD[#1]{\posx}{\l}{\s}{\posy}{#2}%
446   \FPadd\posy\posy{-\dif}}%
447 \def\legendEf{\@ifnextchar[\@legendEf{\@legendEf []}}%
448 \def\@legendEf[#1]#2{%
449   \legendE[#1]{\posx}{\l}{\s}{\posy}{#2}%
450   \FPadd\posy\posy{-\dif}}%
451 \def\legendFf{\@ifnextchar[\@legendFf{\@legendFf []}}%
452 \def\@legendFf[#1]#2{%
453   \legendF[#1]{\posx}{\l}{\s}{\posy}{#2}%
454   \FPadd\posy\posy{-\dif}}%
455 \def\legendGf{\@ifnextchar[\@legendGf{\@legendGf []}}%
456 \def\@legendGf[#1]#2{%
457   \legendG[#1]{\posx}{\l}{\s}{\posy}{#2}%
458   \FPadd\posy\posy{-\dif}}%

```

**\legendText** A legend without a line: to include some text in the legend box

```

459 \def\legendText{\@ifnextchar[\@legendText{\@legendText []}}%
460 \def\@legendText[#1]#2{%
461   \rput(\posx,\posy){%
462     \makebox[0 cm][l]{%
463       \hspace{-0.1cm}{\footnotesize #2}}}%
464   \FPadd\posy\posy{-\dif}}%

```

Keys to be used in the legend environment:

```

465 \define@key[psset]{whiteBG}{fillcolorWhiteBG}{\def\fillcolorWhiteBG{#1}}%
466 \define@key[psset]{whiteBG}{fillstyleWhiteBG}{\def\fillstyleWhiteBG{#1}}%
467 \define@key[psset]{whiteBG}{framearcWhiteBG}{\def\framearcWhiteBG{#1}}%
468 \define@key[psset]{whiteBG}{linewidthWhiteBG}{\def\linewidthWhiteBG{#1}}%
469 \define@key[psset]{whiteBG}{linestyleWhiteBG}{\def\linestyleWhiteBG{#1}}%
470 \define@key[psset]{whiteBG}{linecolorWhiteBG}{\def\linecolorWhiteBG{#1}}%
471 \pst@addfams{whiteBG}%

```

Default values for the above keys:

```

472 \psset{fillcolorWhiteBG=white, fillstyleWhiteBG=solid,%
473   framearcWhiteBG=0.3, linewidthWhiteBG=0.01, %
474   linestyleWhiteBG=solid, linecolorWhiteBG=black}%

```

**\whiteBG** Create the box of the legend in the given position

```

475 \def\whiteBG{\@ifnextchar[\@whiteBG{\@whiteBG []}}%
476 \def\@whiteBG[#1]#2#3#4#5{%
477   \psframe[framearc=\framearcWhiteBG, fillcolor=\fillcolorWhiteBG,%
478     fillstyle=\fillstyleWhiteBG, linewidth=\linewidthWhiteBG cm,%
479     linestyle=\linestyleWhiteBG, linecolor=\linecolorWhiteBG, #1]%
480     (#2,#3)(#4,#5)}%

```

Keys to control the line length and separation with the text in the legend:

```

481 \define@key[psset]{legendXY}{legendSep}{\def\sepYlegendXY{#1}} %
482 \define@key[psset]{legendXY}{lineLength}{\def\llegendXY{#1}} %

```

```

483 \define@key[psset]{legendXY}{lineTextSep}{\def\slegendXY{#1}} %
484 \define@key[psset]{legendXY}{borderlineSep}{\FPmul\sepTxlegendXY{#1}{2}} %
485 \pst@addfams{legendXY}%

```

Default values:

```

486 \psset{legendSep=4, lineLength=5, lineTextSep=1, borderlineSep=1}%

```

**\legendXY** Plot a legend box and calculate the parameters of the legend in the position given in round brackets, for #4 different legends and with a width of #5.

```

487 \def\legendXY{\ifnextchar[\@legendXY{\@legendXY[]}}%
488 \def\@legendXY[#1](#2,#3)#4#5{%
489   \psset{#1}%
490   \def\sepY{\sepYlegendXY}%
491   \def\l{\llegendXY}%
492   \def\s{\slegendXY}%
493   \def\sepTx{\sepTxlegendXY}%
494   \def\xaXY{#2}%
495   \def\yzXY{#3}%
496   \FPdiv\sep\sepY{8}%
497   \FPdiv\sepY\sepY{1.33} %
498   \FPdiv\x\sep\unitX% To separate \sep mm the legend from the axe
499   \FPdiv\y\sep\unitY% To separate \sep mm the legend from the axe
500   \FPadd\leftX\xaXY{-\x}%
501   \FPadd\highY\yzXY{-\y}%
502   \FPdiv\w{#4}\unitX%
503   \FPadd\rightX\leftX{\w}%
504   \FPdiv\sepTx\sepTx\unitX%
505   \FPadd\posx\leftX\sepTx%
506   \FPdiv\sepTy\sepTy\unitY%
507   \FPadd\posy\highY{-\sepTy}%
508   \FPdiv\dif{\sepY}\unitY% Separation of the legends
509   \FPadd\n{#5}{-1}%
510   \FPmul\lowY\dif\n%
511   \FPadd\lowY\lowY\sepTy%
512   \FPadd\lowY\posy{-\lowY}%
513   \whiteBG[#1]{\leftX}{\lowY}{\rightX}{\highY}}%

```

**\legend[UL,UR,DL,DR]** Put the legend box in the positions upper-left, upper-right, down-left and down-right. The input parameters are the optional keys, the number of legends and the width.

```

514 \def\legendUL{\ifnextchar[\@legendUL{\@legendUL[]}}%
515 \def\@legendUL[#1]#2#3{%
516   \FPmul\xUL\xa{1}%
517   \FPmul\yUL\yz{1}%
518   \legendXY[#1](\xUL,\yUL){#2}{#3}}%
519 %
520 \def\legendUR{\ifnextchar[\@legendUR{\@legendUR[]}}%
521 \def\@legendUR[#1]#2#3{%
522   \FPmul\xUR\xz{1}%
523   \FPmul\yUR\yz{1}%

```

```

524 \def\sep{0.5}%
525 \FPdiv\xp\sep\unitX% To separate \sep mm the legend from the axe
526 \FPMul\xp\xp{2}%
527 \FPadd\xp\XUR{-\xp}%
528 \FPdiv\xx{#2}\unitX%
529 \FPadd\xp\xp{-\xx}%
530 \legendXY[#1](\xp,\yUR){#2}{#3}%
531 %
532 \def\legendDL{\@ifnextchar[\@legendDL{\@legendDL[]}}%
533 \def\@legendDL[#1]#2#3{%
534 \psset{#1}%
535 \def\sepY{\sepYlegendXY}%
536 \def\sepTx{\sepTxlegendXY}%
537 \FPMul\XzDL\Xz{1}%
538 \FPMul\XaDL\Xa{1}%
539 \FPMul\YzDL\Yz{1}%
540 \FPMul\YaDL\Ya{1}%
541 \FPdiv\sep\sepY{8}%
542 \FPdiv\sep\sepY{8}%
543 \FPdiv\sepYy\sepY{1.33} %
544 \FPdiv\X\sep\unitX% To separate \sep mm the legend from the axe
545 \FPdiv\Y\sep\unitY% To separate \sep mm the legend from the axe
546 \FPadd\leftX\XaDL{0}%
547 \FPdiv\W{#2}\unitX%
548 \FPadd\rightX\leftX{\W}%
549 \FPdiv\sepTx\sepTx\unitX%
550 \FPadd\posx\leftX\sepTx%
551 \FPadd\lowY\YaDL{\Y}%
552 \FPadd\lowY\lowY{\Y}%
553 \FPdiv\sepTy\sepYy\unitY%
554 \FPadd\posy\lowY{\sepTy}%
555 \FPdiv\dif\sepY\unitY% Separation of the legends
556 \FPadd\N{#3}{-1}%
557 \FPMul\highY\dif\N%
558 \FPadd\highY\highY\sepTy%
559 \FPadd\highY\posy{\highY}%
560 \FPadd\posy\highY{-\sepTy}%
561 \legendXY[#1](\leftX,\highY){#2}{#3}%
562 %
563 \def\legendDR{\@ifnextchar[\@legendDR{\@legendDR[]}}%
564 \def\@legendDR[#1]#2#3{%
565 \psset{#1}%
566 \def\sepY{\sepYlegendXY}%
567 \def\sepTx{\sepTxlegendXY}%
568 \FPMul\XzDR\Xz{1}%
569 \FPMul\XaDR\Xa{1}%
570 \FPMul\YzDR\Yz{1}%
571 \FPMul\YaDR\Ya{1}%
572 \FPdiv\sep\sepY{8}%
573 \FPdiv\sepYy\sepY{1.33} %

```

```

574 \FPdiv\x\sep\unitX% To separate \sep mm the legend from the axe
575 \FPdiv\y\sep\unitY% To separate \sep mm the legend from the axe
576 \FPadd\rightX\xzDR{-\x}%
577 \FPdiv\w{#2}\unitX%
578 \FPadd\leftX\rightX{-\w}%
579 \FPadd\leftX\leftX{-\x}%
580 \FPdiv\sepTx\sepTx\unitX%
581 \FPadd\posx\leftX\sepTx%
582 \FPadd\lowY\yaDR{\y}%
583 \FPadd\lowY\lowY{\y}%
584 \FPdiv\sepTy\sepTy\unitY%
585 \FPadd\posy\lowY{\sepTy}%
586 \FPdiv\dif{\sepY}\unitY% Separation of the legends
587 \FPadd\n{#3}{-1}%
588 \FPmul\highY\dif\n%
589 \FPadd\highY\highY\sepTy%
590 \FPadd\highY\posy{\highY}%
591 \FPadd\posy\highY{-\sepTy}%
592 \legendXY[#1](\leftX,\highY){#2}{#3}%

```

This is the end

```

593 \makeatother%
594 \end{makeplot}

```

# Index

Numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in **roman** refer to the code lines where the entry is used.

<b>C</b>	<b>\legend</b> . . . . . 390	<b>P</b>
<b>\caption</b> . . . . . 19	406, 410, 414,	<b>\PackageWarning</b> . . 115
<b>\centering</b> . . . . . 6	418, 422, 426, 430	<b>perl</b> . . . . . 4
<b>\color</b> . . . . . <u>100</u>	<b>\legend[ABCDEFGF]</b> . . <u>403</u>	<b>\plotFile</b> . . . 3, <u>359</u> ,
<b>\colorLine[ABCDEFGF]</b> . 1	<b>\legend[ABCDEFGF]f</b> 9, <u>431</u>	365, 369, 373,
	<b>\legend[DL,DR,UL,UR]</b> 4	377, 381, 385, 389
<b>D</b>	<b>\legend[UL,UR,DL,DR]</b>	<b>\plotFile[ABCDEFGF]</b> . . 3
<b>\DeclareOption</b> . . . . .	514	<b>\plotFileA</b> . . . . 12, <u>362</u>
. . . . 102, 109, 114	<b>\legendA</b> . . . . 403, 433	<b>\plotFileB</b> . . . . 13, <u>366</u>
<b>\defaultOptionsMakeplot</b>	<b>\legendAf</b> . . . . 15, 431	<b>\plotFileC</b> . . . . . 370
. . . . . 2, <u>220</u> , 225	<b>\legendB</b> . . . . 407, 437	<b>\plotFileD</b> . . . . . <u>374</u>
<b>\documentclass</b> . . . . 2	<b>\legendBf</b> . . . . 16, 435	<b>\plotFileE</b> . . . . . <u>378</u>
<b>\drawmargins</b> . . . . . <u>107</u>	<b>\legendC</b> . . . . 411, 441	<b>\plotFileF</b> . . . . . <u>382</u>
	<b>\legendCf</b> . . . . . 439	<b>\plotFileG</b> . . . . . <u>386</u>
<b>E</b>	<b>\legendD</b> . . . . 415, 445	<b>ps2eps</b> . . . . . 5
<b>\else</b> . 157, 213, 315, 319	<b>\legendDL</b> . . . . . 443	<b>\psaxes</b> 325, 332, 339, 350
<b>\end</b> . . . . 17, 21, 23, 219	<b>\legendDL</b> . . . . 14, 532	<b>S</b>
<b>\endXa</b> 240, 286, 287, 289	<b>\legendDR</b> . . . . . 563	<b>\styleofLine[ABCDEFGF]</b>
<b>\endXamakeplot</b> 191, 240	<b>\legendE</b> . . . . 419, 449	. . . . . 2
<b>\endXb</b> . . . . 241, 284, 285	<b>\legendEf</b> . . . . . 447	<b>\styleoflineA</b> . . . . .
<b>\endXbmakeplot</b> 193, 241	<b>\legendF</b> . . . . 423, 453	. 119, 148, 364, 405
<b>environments:</b>	<b>\legendFf</b> . . . . . 451	<b>\styleoflineB</b> . . . . .
<b>makeplot</b> . . . . . <u>217</u>	<b>\legendG</b> . . . . 427, 457	. 122, 149, 368, 409
<b>environments:makeplot</b>	<b>\legendGf</b> . . . . . 455	<b>\styleoflineC</b> . . . . .
<b>makeplot</b> . . . . . 2	<b>\legendText</b> . . . . 9, <u>459</u>	. 125, 150, 372, 413
<b>EPS</b> . . . . . 4	<b>\legendUL</b> . . . . . 514	<b>\styleoflineD</b> . . . . .
	<b>\legendUR</b> . . . . . 520	. 128, 151, 376, 417
<b>F</b>	<b>\legendXY</b> . . . 4, <u>487</u> ,	<b>\styleoflineE</b> . . . . .
<b>\Font\commands</b> . . . . 2	518, 530, 561, 592	. 131, 152, 380, 421
<b>\Font\sizes</b> . . . . . <u>161</u>	<b>M</b>	<b>\styleoflineF</b> . . . . .
<b>\fontaxeX</b> . 162, 248, 250	<b>makefigure.bat</b> . . . . . 5	. 134, 153, 384, 425
<b>\fontaxeY</b> . 161, 249, 251	<b>\makeplot</b> . . 3, 218, <u>221</u>	<b>\styleoflineG</b> . . . . .
<b>\fontlegend</b> . . 165, 402	<b>makeplot</b> (environ-	. 137, 154, 388, 429
<b>\fonttitleX</b> . . 164, 356	ment) . . . . 2, <u>217</u>	<b>U</b>
<b>\fonttitleY</b> . . 163, 355	<b>Matlab</b> . . . . . 4	<b>\usepackage</b> . . . . . 3
<b>L</b>	<b>\MPbg</b> . . . . . 1, <u>118</u> , 158	<b>W</b>
<b>\label</b> . . . . . 20	<b>\MPcolor</b> 1, 140, 147, 156	<b>\whiteBG</b> . . . . 475, 513