pst-optexp
A PSTricks package to draw optical experimental setups

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Contents

1 Introduction

The package `pst-optexp` is a collection of optical components that facilitate easy sketching of optical experimental setups. Mechanisms for proper alignment of different components are provided internally. This way the user does not have to care for proper orientation of the elements. Macros for convenient definition of new user-defined components are also provided.

2 Components

In the sections 2.1.1–2.1.12 the available components with their parameters are described. Up to now there are two types of components: those which require two reference points and do not alter the direction of the passing light beam (for example lenses and retardation plates) and those which work in reflection and require three reference points (mirrors, grids, beamsplitters etc.).

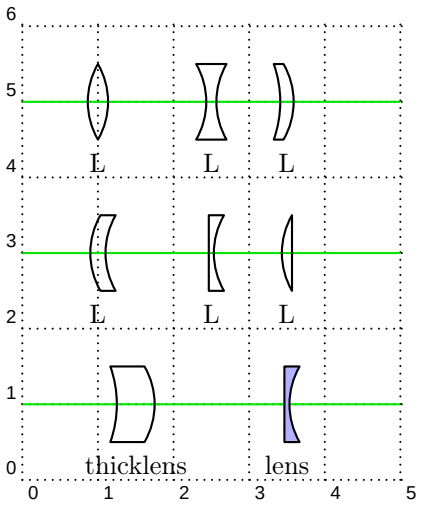
In section 2.1.13 general parameters are described that are not proprietary to a specific unit but can be used for several different components. Finally, in section 2.3 the options for the positioning of labels are explained.

The appearence of all components can be changed with the corresponding standard PSTricks parameters such as `fillstyle` or `linestyle`. For some components changing only parts of the layout is possible (e.g. the extended part of mirrors). For those cases psstyles are provided that influence only the corresponing part of the components and can be redefined using `\newpsstyle`.

2.1 Free-ray components

2.1.1 Lens

lensheight: `<value>` (*default:* `1`)
lenswidth: `<value>` (*default:* `0.3`)
lensradius: `<value> [<value>]` (*default:* `\empty`)
lensradiusleft: `<value>` (*default:* `1`)
lensradiusright: `<value>` (*default:* `1`)
lens: `<value> [<value> [<value> [<value>]]]` (*default:* `\empty`)
thicklens: `<boolean>`(*default:* `false`)



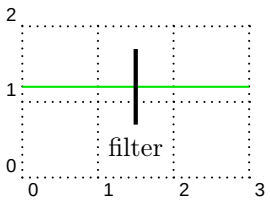

```
\begin{pspicture}(5,6)\psgrid
  % concave lenses
  \pnode(0,5){A}\pnode(5,5){B}
  \psline[style=OptBeam](A)(B)
  \lens[position=0.2](A)(B){L}
  \lens[lensradius=-1,position=0.5](A)(B){L}
  \lens[lens=-1.5 1,position=0.7](A)(B){L}
  % convex lenses
  \pnode(0,3){A}\pnode(5,3){B}
  \psline[style=OptBeam](A)(B)
  \lens[position=0.2,lens=1 -1](A)(B){L}
  \lens[lens=0 -1](A)(B){L}
  \lens[lens=1 0,position=0.7](A)(B){L}
  % thick lenses
  \pnode(0,1){A}\pnode(5,1){B}
  \psline[style=OptBeam](A)(B)
  \lens[position=0.3,lens=-1.5 1 1
    0.5,thicklens](A)(B){thicklens}
  \lens[lens=0 -1, position=0.7, fillstyle=solid,
    fillcolor=blue!30!white](A)(B){lens}
\end{pspicture}
```

The shape of a lens is defined by its two surface radii. A negative radius gives a concave, a positive radius a convex and a radius of `0` a plain surface. The parameters `lensradiusleft` and `lensradiusright` allow to define independent values for both surfaces. `lensradius` sets both curvatures to the same value. Usually only `lensheight` and the two radii are used to construct the lens. The thickness (or width) is determined automatically. Manually controlling the thickness of the lens can be achived by setting `thicklens` to `true`. Then `lenswidth` is used as width of the lens at its waist. Finally, the parameter `lens` allows the definition of all relevant lens parameters at once. It consists of one up to four space-separated numbers. The first one gives the left radius. If no further value is set, the right radius will be set to the same value and all other parameters are left unchanged. Using two numbers defines two different radii. The third optional value defines the `lensheight` and the fourth one the `lenswidth`

Compatibility: The whole implementation of the lens was changed in version 1.2. It allows a much more flexible definition of different lens types. However, I could not get full compatibility with the older way to define lens using only `lensheight` and `lenswidth`. To use this old behaviour, you have to set the `lenstype` explicitly, but then you have no access to the new features! All users are encouraged to adapt their code to use the new parameters, as the old code will be removed in future versions.

2.1.2 Optical plate

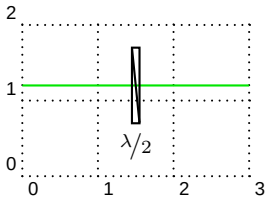
plateheight: `<value>` (*default:* `1`)
platelinewidth: `<value>` (*default:* `2\pslinewidth`)




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \optplate(A)(B){filter}
\end{pspicture}
```

2.1.3 Retardation plate

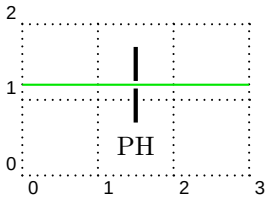
plateheight: `<value>` (*default:* `1`)
platewidth: `<value>` (*default:* `0.1`)




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \optretplate(A)(B){$\nicefrac{\lambda}{2}$}
\end{pspicture}
```

2.1.4 Pinhole

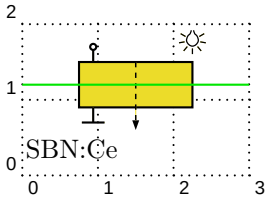
outerheight: <value> (*default:* 1)
innerheight: <value> (*default:* 0.1)
phlinewidth: <value> (*default:* 2\pslinewidth)




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \pinhole(A)(B){PH}
\end{pspicture}
```

2.1.5 Crystal

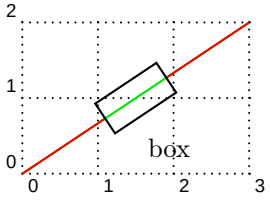
crystalwidth: <value> (*default:* 2)
crystalheight: <value> (*default:* 0.8)
caxislength: <value> (*default:* 0.6)
caxisinv: <boolean> (*default:* false)
voltage: <boolean> (*default:* false)
lamp: <boolean> (*default:* false)
lampscale: <value> (*default:* 0.3)



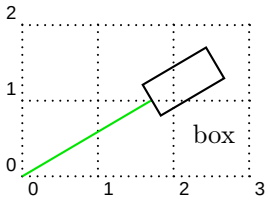

```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \crystal[crystalwidth=1.5, crystalheight=0.6, fillstyle=solid,
    fillcolor=yellow!90!black, labelangle=-45, labeloffset=1.2,
    voltage, lamp](A)(B){SBN:Ce}
  \psline[style=OptBeam](A)(B)
\end{pspicture}
```

2.1.6 Box

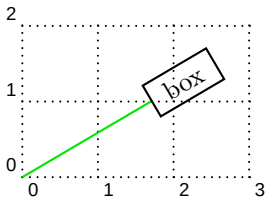
optboxheight: <value> (*default:* 0.5)
optboxwidth: <value> (*default:* 1)
endbox: <boolean> (*default:* false)




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,0){A}
  \pnode(3,2){B}
  \psline[style=OptBeam](A)(B)
  \optbox(A)(B){box}
\end{pspicture}
```



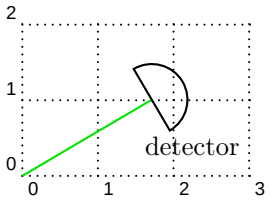

```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,0){A}
  \pnode(1.7,1){B}
  \psline[style=OptBeam](A)(B)
  \optbox[endbox](A)(B){box}
\end{pspicture}
```




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,0){A}
  \pnode(1.7,1){B}
  \psline[style=OptBeam](A)(B)
  \optbox[endbox,labelref=relative,labeloffset=0](A)(B){box}
\end{pspicture}
```

2.1.7 Detector

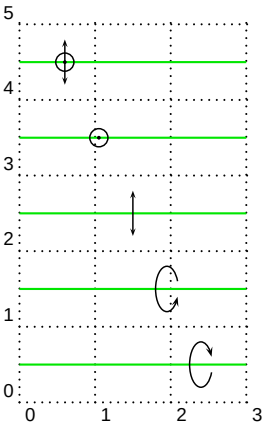
detsize: <value> (*default:* 0.5)




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,0){A}
  \pnode(1.7,1){B}
  \psline[style=OptBeam](A)(B)
  \detector(A)(B){detector}
\end{pspicture}
```

2.1.8 Polarization

poltype: parallel|perp|misc|lcirc|rcirc (*default:* parallel)
polsize: <value> (*default:* 0.6)
pollinewidth: <value> (*default:* 0.7\pslinewidth)

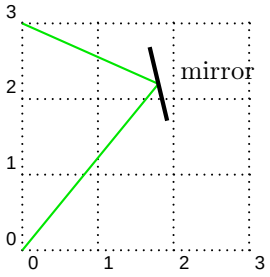


```
\begin{pspicture}(3,5)\psgrid
  \pnode(0,0.5){A1}\pnode(3,0.5){B1}\pnode(0,1.5){A2}
  \pnode(3,1.5){B2}\pnode(0,2.5){A3}\pnode(3,2.5){B3}
  \pnode(0,3.5){A4}\pnode(3,3.5){B4}\pnode(0,4.5){A5}
  \pnode(3,4.5){B5}\psset{style=OptBeam}
  \multido{\i=1+1}{5}{\psline(A\i)(B\i)}
  \psset{linecolor=black}
  \polarization[poltype=misc,position=0.2](A5)(B5)
  \polarization[poltype=perp,position=0.35](A4)(B4)
  \polarization[poltype=parallel,position=0.5](A3)(B3)
  \polarization[poltype=rcirc,position=0.65](A2)(B2)
  \polarization[poltype=lcirc,position=0.8](A1)(B1)
\end{pspicture}
```

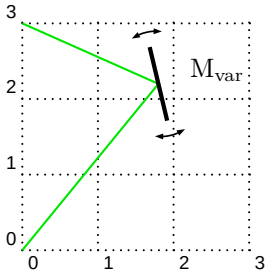
2.1.9 Mirror

mirrorwidth: `<value>` (*default:* `1`)
mirrorradius: `<value>` (*default:* `0`)
mirrorlinewidth: `<value>` (*default:* `2\pslinewidth`)
mirrortype: `normal|piezo|extended` (*default:* `normal`)
mirrordepth: `<value>` (*default:* `0.08`)
variable: `<value>` (*default:* `false`)

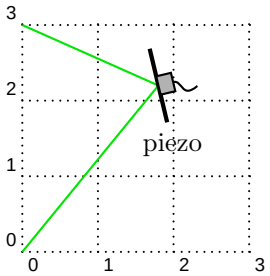
The parameter `mirrorradius` defines the curvature of the mirror. A value of `0` is for a plain mirror, a negative radius is for a concave mirror and a positive radius gives you a convex mirror. The style of the extended mirror is defined as a psstyle `ExtendedMirror` and can be changed using `\newpsstyle`. The appearence of the piezo mirror likewise can be changed by adapting the psstyle `PiezoMirror`.



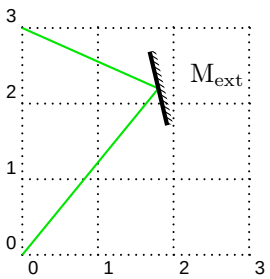

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}
  \pnode(1.8,2.2){G}
  \pnode(0,3){B}
  \psline[style=OptBeam](A)(G)(B)
  \mirror(A)(G)(B){mirror}
\end{pspicture}
```



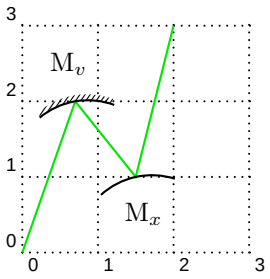

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}
  \pnode(1.8,2.2){G}
  \pnode(0,3){B}
  \psline[style=OptBeam](A)(G)(B)
  \mirror[variable](A)(G)(B){M$_\mathrm{var}$}
\end{pspicture}
```




```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}
  \pnode(1.8,2.2){G}
  \pnode(0,3){B}
  \psline[style=OptBeam](A)(G)(B)
  \mirror[mirrortype=piezo,labelangle=-90](A)(G)(B){piezo}
\end{pspicture}
```



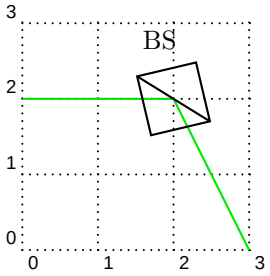

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}
  \pnode(1.8,2.2){G}
  \pnode(0,3){B}
  \psline[style=OptBeam](A)(G)(B)
  \mirror[mirrortype=extended](A)(G)(B){M$_\mathrm{ext}$}
\end{pspicture}
```




```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}\pnode(0.7,2){G1}
  \pnode(1.5,1){G2}\pnode(2,3){B}
  \psset{labeloffset=0.5}
  \psline[style=OptBeam](A)(G1)(G2)(B)
  \mirror[mirrortype=extended, mirrorradius=1](A)(G1)(G2){M$_v$}
  \mirror[mirrorradius=-1](G1)(G2)(B){M$_x$}
\end{pspicture}
```

2.1.10 Beamsplitter

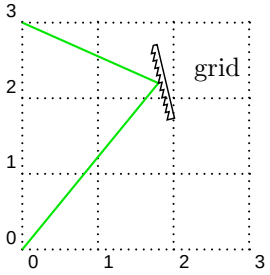
bssize: <value> (*default:* 0.8)



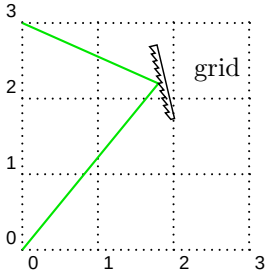

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,2){A}
  \pnode(2,2){G}
  \pnode(3,0){B}
  \psline[style=OptBeam](A)(G)(B)
  \beamsplitter(A)(G)(B){BS}
\end{pspicture}
```

2.1.11 Optical grid

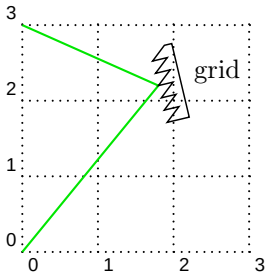
optgridcount: <integer> (*default:* 10)
optgridwidth: <value> (*default:* 1)
optgridheight: <value> (*default:* 0.1)
optgriddepth: <value> (*default:* 0.05)
optgridtype: blazed|binary (*default:* blazed)
optgridlinewidth: <value> (*default:* 0.7\pslinewidth)
reverse: <boolean> (*default:* false)



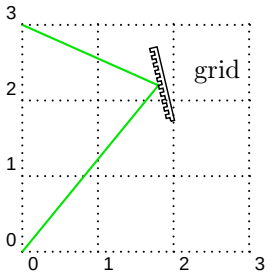

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,3){A}
  \pnode(1.8,2.2){G}
  \pnode(0,0){B}
  \psline[style=OptBeam](A)(G)(B)
  \optgrid(A)(G)(B){grid}
\end{pspicture}
```




```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,3){A}
  \pnode(1.8,2.2){G}
  \pnode(0,0){B}
  \psline[style=OptBeam](A)(G)(B)
  \optgrid[reverse](A)(G)(B){grid}
\end{pspicture}
```



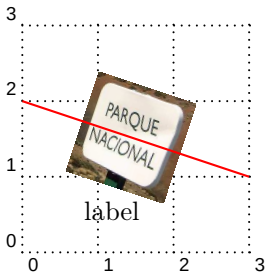

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,3){A}
  \pnode(1.8,2.2){G}
  \pnode(0,0){B}
  \psline[style=OptBeam](A)(G)(B)
  \optgrid[optgridcount=6,%
           optgriddepth=0.2,%
           optgridheight=0.3](A)(G)(B){grid}
\end{pspicture}
```



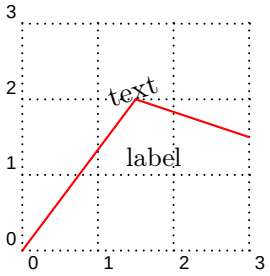

```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,3){A}
  \pnode(1.8,2.2){G}
  \pnode(0,0){B}
  \psline[style=OptBeam](A)(G)(B)
  \optgrid[optgridtype=binary](A)(G)(B){grid}
\end{pspicture}
```

2.1.12 Custom components

The macros \optdipole and \opttripole allow using everything as optical component. If you want to use a certain component several times, you should define it as a new component. For details see sec. 3.2.




```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,2){A}
  \pnode(3,1){B}
  \optdipole[labeloffset=1](A)(B){%
    \rput(0,0){%
      \includegraphics[scale=0.25]{parque-nacional}
    }
  }{label}
  \psline[linecolor=red](A)(B)
\end{pspicture}
```

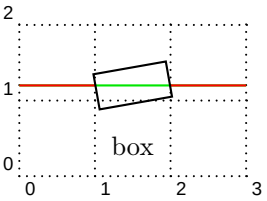



```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}
  \pnode(1.5,2){G}
  \pnode(3,1.5){B}
  \opttripole(B)(G)(A){\rput[b](0,0){text}}{label}
  \psline[linecolor=red](A)(G)(B)
\end{pspicture}
```

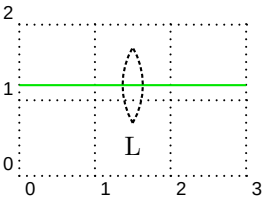
2.1.13 General options

angle: <value> (*default:* 0)
optional: <boolean> (*default:* false)
position: <value> (*default:* \empty)
abspos: <value> (*default:* \empty)
showoptdots: <boolean> (*default:* false)

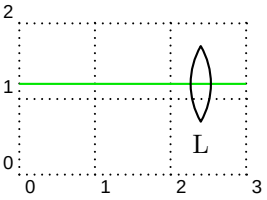
The parameter `angle` is available for the macros `\optbox` and `\crystal` only, as for the most other cases it would make no sense. `optional` can be used with every component and marks it as optional and can be configured by changing the psstyle `OptionalStyle`. `position` is equivalent to the `npos` parameter of `\ncput`, but is used only for the 'dipole'-macros to position the component between the two given points. In addition, there is a parameter `abspos` that allows absolute positioning between the two line points. `showoptdots` shows in black the two points calculated for the positioning of the component, and in red the reference points for the label.



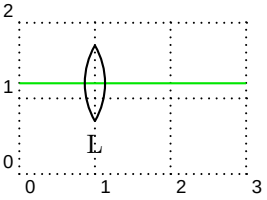

```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \optbox[angle=10](A)(B){box}
\end{pspicture}
```



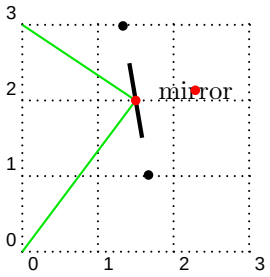

```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \lens[optional](A)(B){L}
\end{pspicture}
```




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \lens[position=0.8](A)(B){L}
\end{pspicture}
```




```
\begin{pspicture}(3,2)\psgrid
  \pnode(0,1.2){A}
  \pnode(3,1.2){B}
  \psline[style=OptBeam](A)(B)
  \lens[abspos=1](A)(B){L}
\end{pspicture}
```

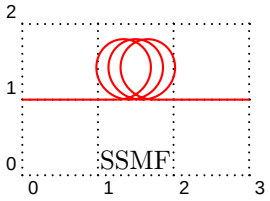



```
\begin{pspicture}(3,3)\psgrid
  \pnode(0,0){A}
  \pnode(1.5,2){G}
  \pnode(0,3){B}
  \psline[style=OptBeam](A)(G)(B)
  \mirror[showoptdots](A)(G)(B){mirror}
\end{pspicture}
```

2.2 Fiber-optical components

2.2.1 Fiber

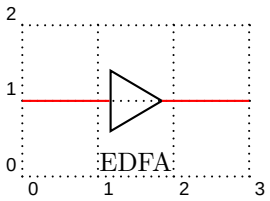
fiberloops: `<integer>` (*default:* `3`)
fiberloopradius: `<value>` (*default:* `0.3`)
fiberloopsep: `<value>` (*default:* `0.3`)




```
\begin{pspicture}(3,2)\psgrid
  \optfiber(0,1)(3,1){SSMF}
\end{pspicture}
```

2.2.2 Amplifier

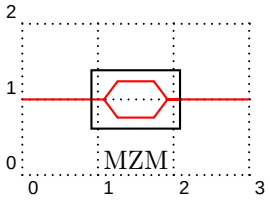
optampsize: `<value>` (*default:* `0.8`)




```
\begin{pspicture}(3,2)\psgrid
  \optamp(0,1)(3,1){EDFA}
\end{pspicture}
```

2.2.3 Mach-Zehnder Modulator

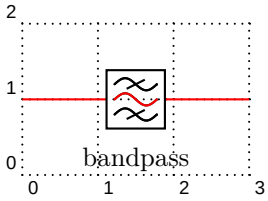
optmzmsize: `<value>` (*default:* `0.8`)



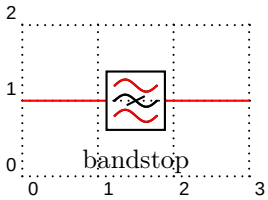

```
\begin{pspicture}(3,2)\psgrid
  \optmzm(0,1)(3,1){MZM}
\end{pspicture}
```

2.2.4 Filter

filtertype: `bandpass|bandstop` (*default:* `bandpass`)



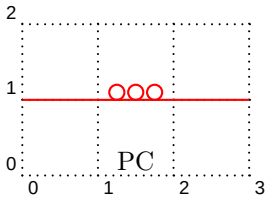

```
\begin{pspicture}(3,2)\psgrid
  \optfilter(0,1)(3,1){bandpass}
\end{pspicture}
```




```
\begin{pspicture}(3,2)\psgrid
  \optfilter[filtertype=bandstop](0,1)(3,1){bandstop}
\end{pspicture}
```

2.2.5 Polarization controller

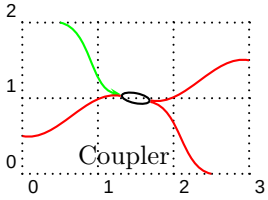
polcontrolsize: `<value>` (*default:* `0.1`)




```
\begin{pspicture}(3,2)\psgrid
  \polcontrol(0,1)(3,1){PC}
\end{pspicture}
```

2.2.6 2×2 Coupler

couplersize: `<value>` (*default:* `0.1`)
couplerstyle: `free|elliptic` (*default:* `elliptic`)

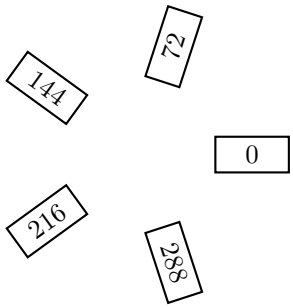



```
\begin{pspicture}(3,2)\psgrid
  \optcoupler(0.5,2)(0,0.5)(3,1.5)(2.5,0){Coupler}
\end{pspicture}
```

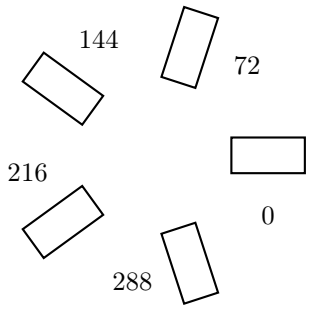
2.3 Labels

labeloffset: `<value>` (*default:* `1`)
labelangle: `<value>` (*default:* `0`)
labelstyle: `<macro>` (*default:* `\small`)
labelalign: `<\rput ref string>` (*default:* `c`)
labelref: `relative|relgrav|global` (*default:* `relgrav`)

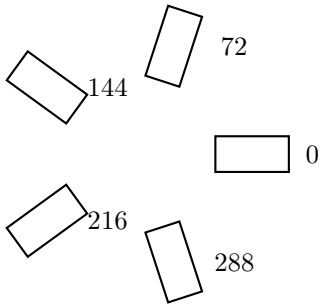
`labeloffset` specifies the offset from the center of the component, `labelstyle` defines the textstyle that is used to typeset the label and `labelalign` corresponds to the refpoint of `\rput`. The parameter `labelref` sets the reference coordinate system for the `labelangle` and the orientation of the label text. The detailed behaviour is best illustrated looking at the following three examples.




```
\begin{pspicture}(-2,-2)(2.5,2)
   \multido{\i=0+72}{5}{%
      \optbox[endbox,
              labelref=relative,
              labeloffset=0,
              optboxwidth=1](0,0)(1;\i){\i}
   }
\end{pspicture}
```




```
\begin{pspicture}(-2,-2)(2.5,2)
   \multido{\i=0+72}{5}{%
      \optbox[endbox,
              labelref=relgrav,
              optboxwidth=1](0,0)(1;\i){\i}
   }
\end{pspicture}
```

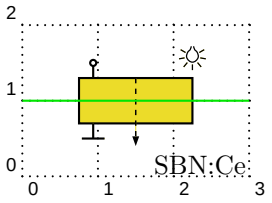



```
\begin{pspicture}(-2,-2)(2.5,2)
   \multido{\i=0+72}{5}{%
      \optbox[endbox,
              labelref=global,
              optboxwidth=1](0,0)(1;\i){\i}
   }
\end{pspicture}
```

3 Defining new components

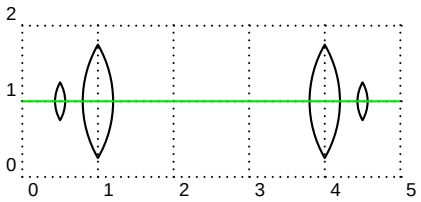
3.1 Customized versions of existing macros

The easiest way to define your own components is to use the `\newpsobject` macro. With this you can define a new component using predefined objects with a set of options. These options serve only as default values and can be overridden. The following examples defines a new object `\sbn` for the special crystal used in Sec. 2.1.5.




```
\newpsobject{sbn}{crystal}{crystalwidth=1.5, crystalheight=0.6,
  voltage, lamp, labelangle=45, labeloffset=1.2, fillstyle=solid,
  fillcolor=yellow!90!black}
\begin{pspicture}(3,2)\psgrid
   \sbn(0,1)(3,1){SBN:Ce}
   \psline[style=OptBeam](0,1)(3,1)
\end{pspicture}
```

If you need more than one type of lenses in your setup it is very cumbersome to specify all parameters every time.



```
\newpsobject{MOLensIn}{lens}{lens=0.5 0.5 0.5}
\newpsobject{MOLensOut}{lens}{lens=1.5 1.5 1.5}
\begin{pspicture}(5,2)\psgrid
   \pnode(0,1){A}\pnode(5,1){B}
   \MOLensIn[abspos=0.5](A)(B){}
   \MOLensOut[abspos=1](A)(B){}
   \MOLensOut[abspos=4](A)(B){}
   \MOLensIn[abspos=4.5](A)(B){}
   \psline[style=OptBeam](A)(B)
\end{pspicture}
```

3.2 Defining new free-ray objects

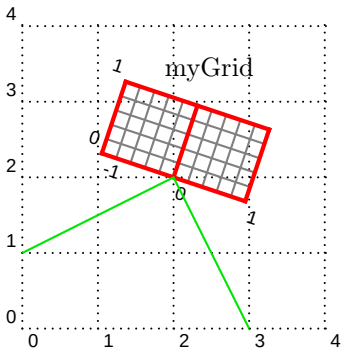
Since version 1.2 `pst-optexp` provides some high-level macros to allow very convenient definition of completely new components. The macro `\newOptexpDipole` generates all organizing code for the new component. All you have to do is to define a new macro `\mycomponent@iii` which contains all drawing code. Analogously `\newOptexpDipoleNolabel` defines a new object which takes no label (like `\polarization`) and `\newOptexpTripole` defines a new reflective component.

The syntax of the macros is

```
\newOptexpDipole[fixed options]{name}{default options}
\newOptexpDipoleNolabel[fixed options]{name}{default options}
\newOptexpTripole[fixed options]{name}{default options}
```

The `default options` are simply a list of PSTricks parameters which are taken as defaults for the new component. The optional argument allows setting of parameters which cannot be overridden later.

This is illustrate a bit more in the next code snippet, which also shows how the coordinate system is handled withing the `\mycomponent@iii` macro.



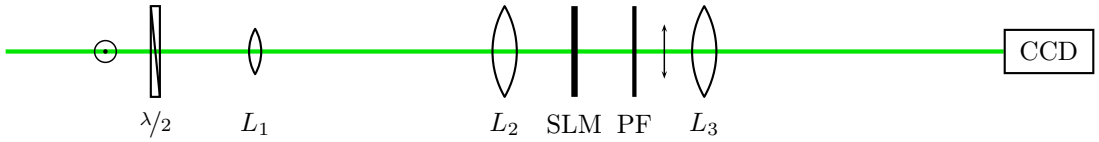

```
\newOptexpTripole{mygrid}{subgriddiv=5, griddots=0,
  subgridwidth=\pslinewidth, gridwidth=2\pslinewidth}
\makeatletter
\def\mygrid@iii{% put here all drawing code
  \psgrid(-1,0)(1,1)
}%
\makeatother
\begin{pspicture}(4,4)\psgrid
   \pnode(0,1){A}\pnode(2,2){G}\pnode(3,0){B}
   \mygrid[gridcolor=red,labeloffset=1.5](A)(G)(B){myGrid}
   \psline[style=OptBeam](A)(G)(B)
\end{pspicture}
```

The default position of the label reference point is (0,0). If you want to change this, you have to define a new pnode named `tempNode@Label` in the `\mycomponent@iii` macro.

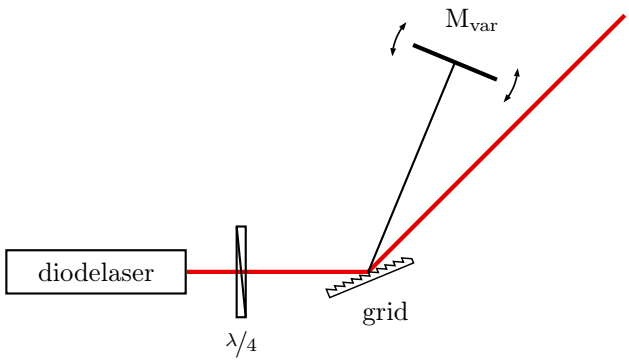
If you create a new component, please send it to me then I can incorporate this in a new released version.

3.3 Defining new fiber objects

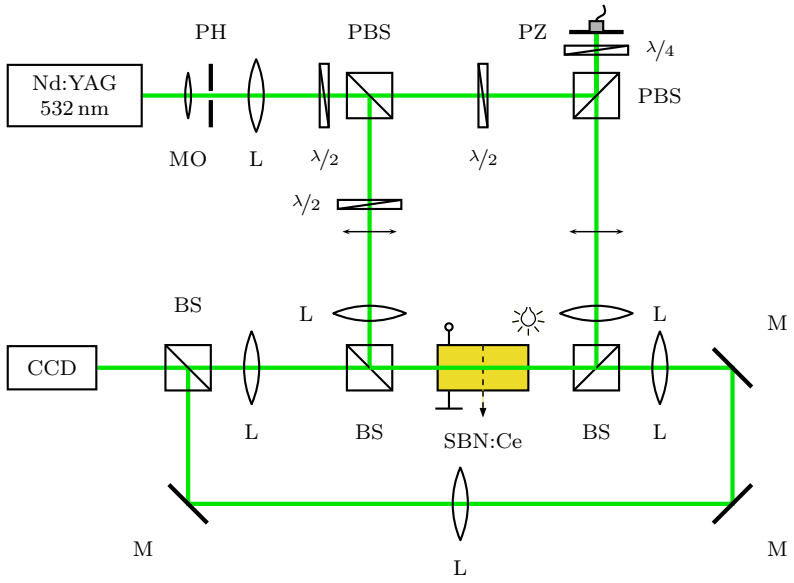
4 Examples




```
\begin{pspicture}(0,0.2)(12,1.8)
\pnode(0,1.2){Start}\pnode(11,1.2){CCD}
\psline[linewidth=2\pslinewidth,style=OptBeam](Start)(CCD)
\polarization[poltype=perp,position=0.1](Start)(CCD)
\optretplate[position=0.15](Start)(CCD){$\nicefrac{\lambda}{2}$}
\lens[lensheight=0.5,
      lensradius=0.5,
      position=0.25](Start)(CCD){$L_1$}
\lens[position=0.5](Start)(CCD){$L_2$}
\optplate[position=0.57, platelinewidth=3\pslinewidth](Start)(CCD){SLM}
\optplate[position=0.63](Start)(CCD){PF}
\polarization[position=0.66](Start)(CCD)
\lens[position=0.7](Start)(CCD){$L_3$}
\optbox[endbox,labeloffset=0](Start)(CCD){CCD}
\end{pspicture}
```




```
\begin{pspicture}(-4,-1)(3,3)
  \psset{labeloffset=0.5}
  \pnode(-2,0){LaserOut}
  \pnode(0,0){Grid}
  \pnode(4;45){Out}
  \pnode(2.5;67.5){Mvar}
  \psline[linewidth=2\pslinewidth,
        linecolor=red!90!black](LaserOut)(Grid)(Out)\psline(Grid)(Mvar)
  \optbox[endbox, optboxwidth=2, labeloffset=0](Grid)(LaserOut){diodelaser}
  \optretplate[position=0.3, labeloffset=0.8](LaserOut)(Grid){$\nicefrac{\lambda}{4}$}
  \optgrid(LaserOut)(Grid)(Out){grid}
  \mirror[variable](Grid)(Mvar)(Grid){M$_\mathrm{var}$}
\end{pspicture}
```




```
\begin{pspicture}(0,-0.4)(9,6)
  \pnode(1.5,5){Laser}\pnode(4,5){PBS}\pnode(6.5,5){PBS2}
  \pnode(6.5,5.7){piezo}\pnode(4,2){BSFwd}\pnode(6.5,2){BSBwd}
  \pnode(2,2){BS4f}\pnode(2,0.5){M4f3}\pnode(8,2){M4f1}
  \pnode(8,0.5){M4f2}\pnode(1,2){CCD}
  \psline[style=OptBeam,linewidth=2\pslinewidth]%
        (Laser)(PBS2)(piezo)(BSBwd)(M4f1)(M4f2)(M4f3)(BS4f)(CCD)
  \psline[style=OptBeam,linewidth=2\pslinewidth](PBS)(BSFwd)(BS4f)
  \psset{mirrorwidth=0.6, plateheight=0.7, outerheight=0.7, labeloffset=0.7,
    labelstyle=\scriptsize, lensheight=0.8, lenswidth=0.2, bssize=0.5}
  \optbox[endbox,optboxwidth=1.5, optboxheight=0.7,labeloffset=0]%
     (PBS)(Laser){\parbox{1.5cm}{\centering Nd:YAG\\ 532\,nm}}
  \lens[lensheight=0.5, position=0.2](Laser)(PBS){MO}
  \pinhole[position=0.3,labelangle=180](Laser)(PBS){PH}
  \lens[position=0.5](Laser)(PBS){L}
  \optretplate[position=0.8](Laser)(PBS){$\nicefrac{\lambda}{2}$}
  \beamsplitter(Laser)(PBS)(BSFwd){PBS}
  \optretplate[position=0.4](PBS)(BSFwd){$\nicefrac{\lambda}{2}$}
  \polarization(PBS)(BSFwd)\polarization(PBS2)(BSBwd)
  \lens[position=0.8](PBS)(BSFwd){L}
  \optretplate(PBS)(PBS2){$\nicefrac{\lambda}{2}$}
  \beamsplitter(PBS)(PBS2)(piezo){PBS}
  \optretplate[abspos=0.5](PBS2)(piezo){$\nicefrac{\lambda}{4}$}
  \mirror[mirrortype=piezo,labelangle=90](PBS2)(piezo)(PBS2){PZ}
  \lens[position=0.8,labelangle=180](PBS2)(BSBwd){L}
  \beamsplitter(PBS)(BSFwd)(BSBwd){BS}
  \beamsplitter[labelangle=-90](PBS2)(BSBwd)(BSFwd){BS}
  \crystal[crystalwidth=1, crystalheight=0.5, voltage, lamp, fillstyle=solid,
    fillcolor=yellow!90!black, labeloffset=0.8](BSFwd)(BSBwd){SBN:Ce}
  \mirror(BSBwd)(M4f1)(M4f2){M}\mirror(M4f1)(M4f2)(M4f3){M}
  \lens[labelangle=180](M4f2)(M4f3){L}\mirror(M4f2)(M4f3)(BS4f){M}
  \beamsplitter(M4f3)(BS4f)(CCD){BS}\optbox[endbox,labeloffset=0](BS4f)(CCD){CCD}
  \lens[abspos=0.7](BS4f)(BSFwd){L}\lens[abspos=0.7](BSBwd)(M4f1){L}
  \psline[style=OptBeam, linewidth=2\pslinewidth](BSFwd)(BSBwd)
\end{pspicture}
```

5 Todo

The next thing I will add are components with multiple internal reflections, as right-angle, penta and dove prisms. The code is almost ready, I just need to think a bit more about the best way to provide access to the nodes that are newly defined within the components.

Fiber optical components are also in preparation.

Drawing of extended beams with focusing and so on could be integrated to some extent in future versions. But as the topic is rather difficult if you want to do it properly (components should be placed above the beam, but the new nodes are available only when the component is drawn) it could take very long until this feature will be implemented.

6 Acknowledgements

I thank all the people of the PSTricks mailinglist for the continuous help, especially Herbert Voß.