

pst-optexp

A PSTricks package to draw optical experimental setups

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Contents			
1 Introduction	1		
2 Components	1		
2.1 Lens	2	2.8 Polarisation	6
2.2 General plate	3	2.9 Mirror	6
2.3 Retardation plate	3	2.10 Beamsplitter	7
2.4 Pinhole	4	2.11 Optical grid	8
2.5 Crystal	4	2.12 Custom components	8
2.6 Box	4	2.13 General options	9
2.7 Detector	5	2.14 Labels	10
		3 Examples	11
		4 Known bugs	14
		5 Todo	14

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.

2 Components

In the following sections [2.9–2.12](#) 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 2.13 general parameters are described that are not proprietary to a specific unit but can be used for several different components. Finally, in section 2.14 the options for the positioning of labels are explained.

2.1 Lens

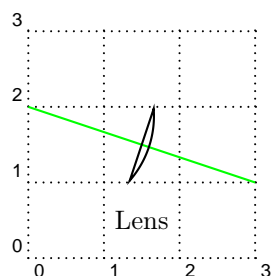
lensheight (dimension): (*default: 1*)

lenswidth (dimension): (*default: 0.3*)

lenstype (plainconvex, plainconcave, convexplain, concaveplain, biconvex, biconcave): (*default: biconvex*)

lensradius (dimension): (*default: \empty*)

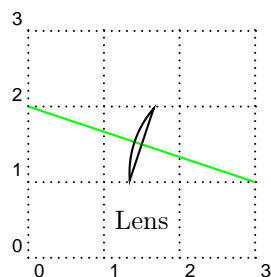
For the convex lenses only two parameters are used. If the parameter **lensradius** is set, its value will be used together with **lensheight** to draw the lens. Otherwise **lenswidth** and **lensheight** are used. For concave lenses all three parameters are needed.



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \lens[lenstype=plainconvex](A)(B){Lens}
6 \end{pspicture}

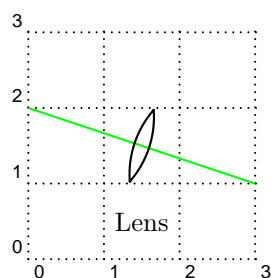
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \lens[lenstype=convexplain](A)(B){Lens}
6 \end{pspicture}

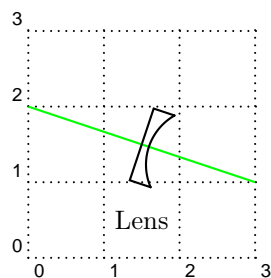
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \lens(A)(B){Lens}
6 \end{pspicture}

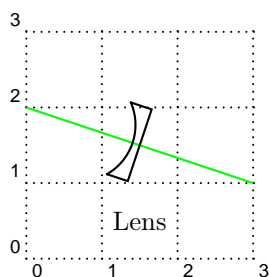
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \lens[lenstype=plainconcave](A)(B){Lens}
6 \end{pspicture}

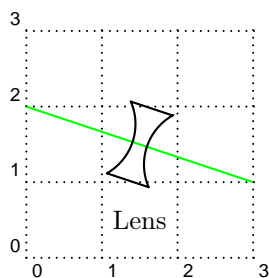
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \lens[lenstype=concaveplain](A)(B){Lens}
6 \end{pspicture}

```



```

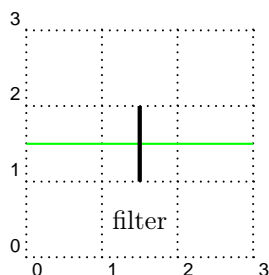
1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \lens[lenstype=biconcave](A)(B){Lens}
6 \end{pspicture}

```

2.2 General plate

plateheight (dimension): (*default: 1*)

platelinewidth (dimension): (*default: 2\pslinewidth*)



```

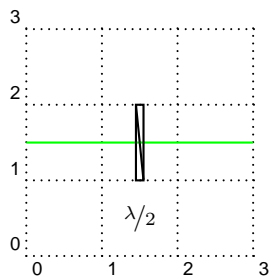
1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \psline[linecolor=green](A)(B)
5   \optplate(A)(B){filter}
6 \end{pspicture}

```

2.3 Retardation plate

plateheight (dimension): (*default: 1*)

platewidth (dimension): (*default: 0.1*)



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \psline[linecolor=green](A)(B)
5   \optretplate(A)(B){$\nicefrac{\lambda}{2}$}
6 \end{pspicture}

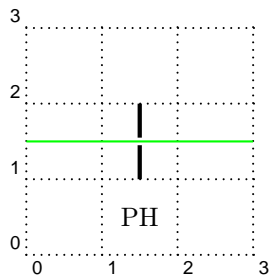
```

2.4 Pinhole

phlinewidth (dimension): (*default 2\pslinewidth*)

owidth (dimension): (*default: 1*)

iwidth (dimension): (*default: 0.1*)



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \psline[linecolor=green](A)(B)
5   \pinhole(A)(B){PH}
6 \end{pspicture}

```

2.5 Crystal

crystalwidth (dimension): (*default: 2*)

crystalheight (dimension): (*default: 0.8*)

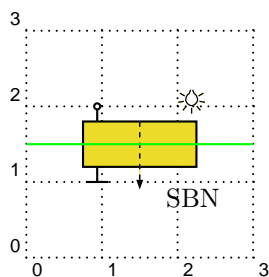
caxislength (dimension): (*default: 0.6*)

caxisinv (boolean): (*default: false*)

voltage (boolean): (*default: false*)

lamp (boolean): (*default: false*)

lampscale (real): (*default: 0.3*)



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \crystal[crystalwidth=1.5,%
5     crystalheight=0.6,%
6     fillstyle=solid,%
7     fillcolor=yellow!90!black,%
8     labelangle=-45,%
9     voltage,%
10    lamp](A)(B){SBN}
11   \psline[linecolor=green](A)(B)
12 \end{pspicture}

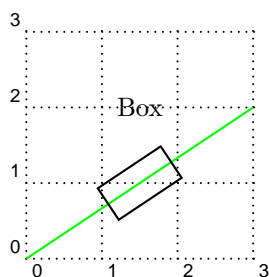
```

2.6 Box

optboxheight (dimension): (*default: 0.5*)

optboxwidth (dimension): (*default: 1*)

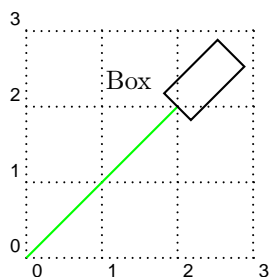
endbox (boolean): (*default: false*)



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(3,2){B}
4   \psline[linecolor=green](A)(B)
5   \optbox[labeloffset=-1](A)(B){Box}
6 \end{pspicture}

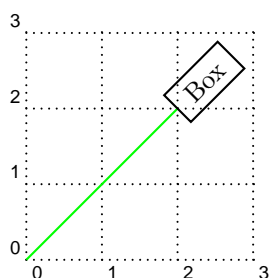
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,2){B}
4   \psline[linecolor=green](A)(B)
5   \optbox[endbox,labeloffset=1,labelangle=180](A)(B){Box}
6 \end{pspicture}

```



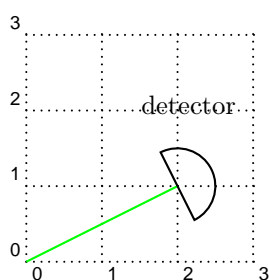
```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,2){B}
4   \psline[linecolor=green](A)(B)
5   \optbox[endbox,labelrelative](A)(B){Box}
6 \end{pspicture}

```

2.7 Detector

detsize (dimension): (default: 0.5)



```

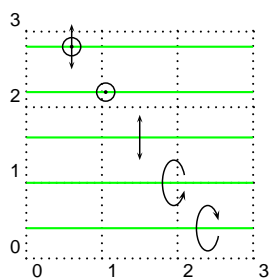
1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,1){B}
4   \psline[linecolor=green](A)(B)
5   \detector[labeloffset=-1](A)(B){detector}
6 \end{pspicture}

```

2.8 Polarisation

pol (parallel,perp,misc,lcirc,rcirc): (*default: parallel*)

polwidth (dimension): (*default: 0.6*)



```

1 \begin{pspicture}(3,3.2)\psgrid
2   \pnode(0,0.4){A1}\pnode(3,0.4){B1}
3   \pnode(0,1){A2}\pnode(3,1){B2}
4   \pnode(0,1.6){A3}\pnode(3,1.6){B3}
5   \pnode(0,2.2){A4}\pnode(3,2.2){B4}
6   \pnode(0,2.8){A5}\pnode(3,2.8){B5}
7   \psline[linecolor=green](A1)(B1)
8   \psline[linecolor=green](A2)(B2)
9   \psline[linecolor=green](A3)(B3)
10  \psline[linecolor=green](A4)(B4)
11  \psline[linecolor=green](A5)(B5)
12  \polarisation[pol=misc,position=0.2](A5)(B5)
13  \polarisation[pol=perp,position=0.35](A4)(B4)
14  \polarisation[pol=parallel,position=0.5](A3)(B3)
15  \polarisation[pol=rcirc,position=0.65](A2)(B2)
16  \polarisation[pol=lcirc,position=0.8](A1)(B1)
17 \end{pspicture}

```

2.9 Mirror

mirrorwidth (dimension): (*default: 1*)

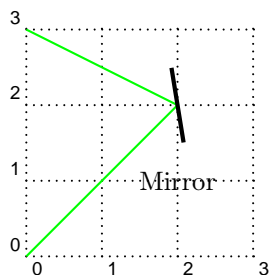
mirrorlinewidth (dimension): (*default: 0.7\pslinewidth*)

mirrortype (normal,piezo,extended): (*default: normal*)

mirrordepth (dimension): (*default: 0.08*)

variable (boolean): (*default: false*)

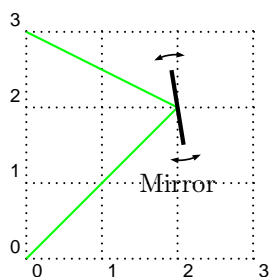
The style of the extended mirror is defined as a psstyle **ExtendedMirror** and can be changed using **\newpsstyle**. The appearance of the piezo mirror likewise can be changed by adapting the psstyle **PiezoMirror**.



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,2){G}
4   \pnode(0,3){B}
5   \psline[linecolor=green](A)(G)(B)
6   \mirror(A)(G)(B){Mirror}
7 \end{pspicture}

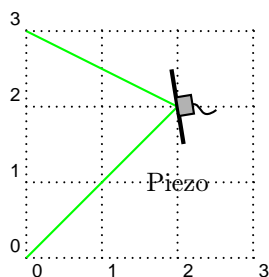
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,2){G}
4   \pnode(0,3){B}
5   \psline[linecolor=green](A)(G)(B)
6   \mirror[variable](A)(G)(B){Mirror}
7 \end{pspicture}

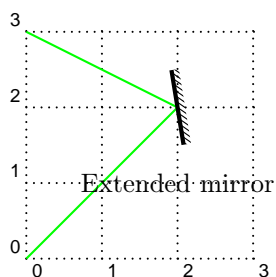
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,2){G}
4   \pnode(0,3){B}
5   \psline[linecolor=green](A)(G)(B)
6   \mirror[mirrortype=piezo](A)(G)(B){Piezo}
7 \end{pspicture}

```



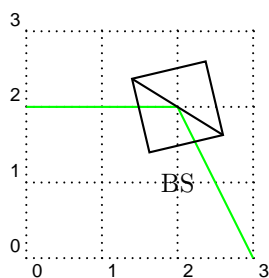
```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(2,2){G}
4   \pnode(0,3){B}
5   \psline[linecolor=green](A)(G)(B)
6   \mirror[mirrortype=extended,
7           mirrordepth=0.1](A)(G)(B){Extended mirror}
8 \end{pspicture}

```

2.10 Beamsplitter

bswidth (dimension): (*default: 1*)



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(2,2){G}
4   \pnode(3,0){B}
5   \psline[linecolor=green](A)(G)(B)
6   \beamsplitter(A)(G)(B){BS}
7 \end{pspicture}

```

2.11 Optical grid

optgridcount (integer): (default: 10)

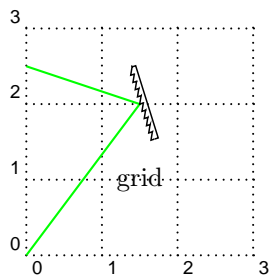
optgridwidth (dimension): (default: 1)

optgridheight (dimension): (default: 0.1)

optgriddepth (dimension): (default: 0.05)

optgridlinewidth (dimension): (default: 0.7\pslinewidth)

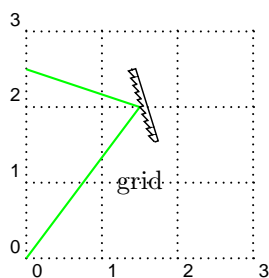
reverse (boolean): (default: false)



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2.5){A}
3   \pnode(1.5,2){G}
4   \pnode(0,0){B}
5   \psline[linecolor=green](A)(G)(B)
6   \optgrid(A)(G)(B){grid}
7 \end{pspicture}

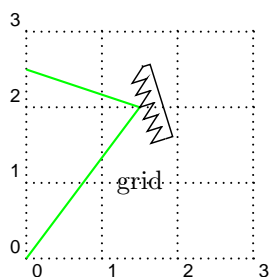
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2.5){A}
3   \pnode(1.5,2){G}
4   \pnode(0,0){B}
5   \psline[linecolor=green](A)(G)(B)
6   \optgrid[reverse](A)(G)(B){grid}
7 \end{pspicture}

```

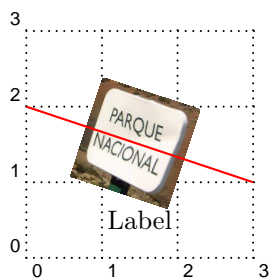


```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2.5){A}
3   \pnode(1.5,2){G}
4   \pnode(0,0){B}
5   \psline[linecolor=green](A)(G)(B)
6   \optgrid[optgridcount=6,%
7             optgriddepth=0.2,%
8             optgridheight=0.3](A)(G)(B){grid}
9 \end{pspicture}

```

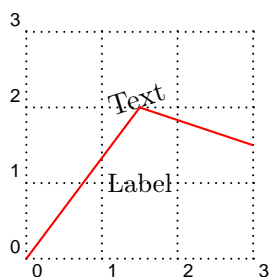
2.12 Custom components



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,2){A}
3   \pnode(3,1){B}
4   \optdipole(A)(B){%
5     \rput(0,0){%
6       \includegraphics[scale=0.25]{parque-nacional}
7     }
8   }{Label}
9   \psline[linecolor=red](A)(B)
10 \end{pspicture}

```

```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(1.5,2){G}
4   \pnode(3,1.5){B}
5   \opttripole(B)(G)(A){\rput[b](0,0){Text}}{Label}
6   \psline[linecolor=red](A)(G)(B)
7 \end{pspicture}

```

2.13 General options

angle (real): (default: 0)

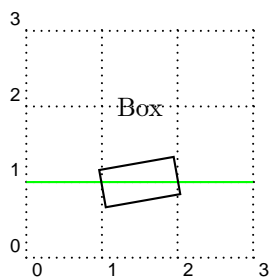
optional (boolean): (default: false)

position (real): (default: \empty)

abspos (dimension): (default: \empty)

showoptdots (boolean): (default: false)

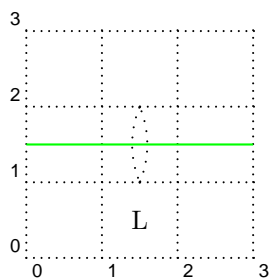
The parameter **angle** is available for the macros `\optbox` and `\crystal` only, as for the most other cases it would make no sense. **optional** can be used with every component and marks it as optional and can be configured by changing the psstyle `OptionalStyle`. **position** is equivalent to the `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 point for the label.



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1){A}
3   \pnode(3,1){B}
4   \psline[linecolor=green](A)(B)
5   \optbox[labeloffset=-1,%
6     angle=10](A)(B){Box}
7 \end{pspicture}

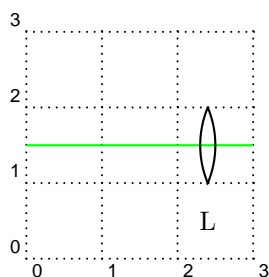
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \psline[linecolor=green](A)(B)
5   \lens[optional](A)(B){L}
6 \end{pspicture}

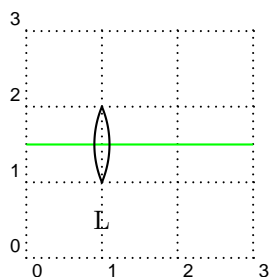
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \psline[linecolor=green](A)(B)
5   \lens[position=0.8](A)(B){L}
6 \end{pspicture}

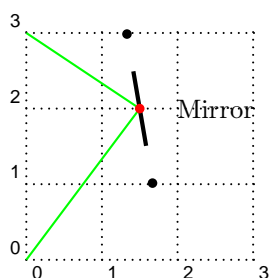
```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,1.5){A}
3   \pnode(3,1.5){B}
4   \psline[linecolor=green](A)(B)
5   \lens[abspos=1](A)(B){L}
6 \end{pspicture}

```



```

1 \begin{pspicture}(3,3)\psgrid
2   \pnode(0,0){A}
3   \pnode(1.5,2){G}
4   \pnode(0,3){B}
5   \psline[linecolor=green](A)(G)(B)
6   \mirror[labelangle=0,showoptdots](A)(G)(B){Mirror}
7 \end{pspicture}

```

2.14 Labels

labeloffset (dimension): (*default: 1*)

labelangle (real): (*default: -90*)

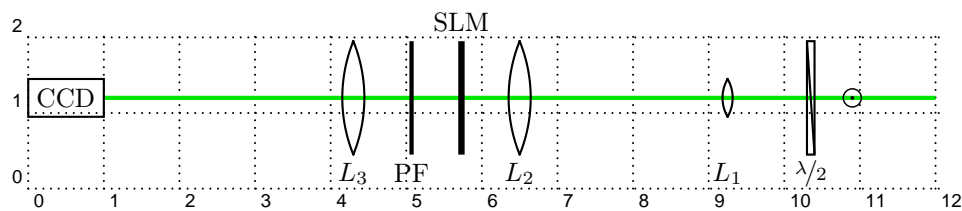
labelstyle (macro): (*default: \small*)

labelalign (\rput pos string): (*default: c*)

labelrelative (boolean): (*default: false*)

labeloffset specifies the offset from the center of the component, **labelangle** is the absolute angle which is independent of the component orientation, **labelstyle** is the textstyle that is used to typeset the label and **labelalign** corresponds to the repoint of **\rput**. With **labelrelative** the label is oriented like the component is.

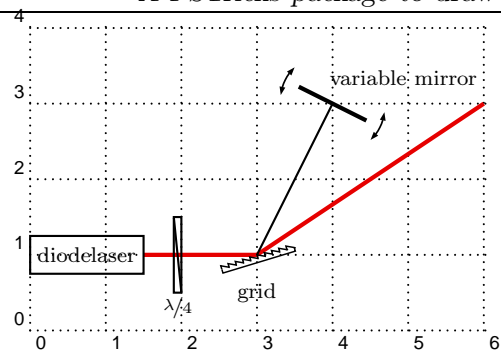
3 Examples



```

1 \begin{pspicture}(12,2.4)\psgrid
2 \pnode(1,1.2){CCD}\pnode(12,1.2){Start}
3 \psline[linewidth=2\pslinewidth,linecolor=green!90!black](Start)(CCD)
4 \psset{plateheight=1.5,
5       lensheight=1.5,
6       lensradius=2}
7 \polarisation[pol=perp,
8               position=0.1](Start)(CCD)
9 \optretplate[position=0.15](Start)(CCD){$\nicefrac{\lambda}{2}$}
10 \lens[lensheight=0.5,
11       lensradius=0.5,
12       position=0.25](Start)(CCD){$L_1$}
13 \lens[position=0.5](Start)(CCD){$L_2$}
14 \optplate[position=0.57,
15           labelangle=90,
16           platelinewidth=3\pslinewidth](Start)(CCD){SLM}
17 \optplate[position=0.63,
18           labelangle=270](Start)(CCD){PF}
19 \lens[position=0.7](Start)(CCD){$L_3$}
20 \optbox[endbox](Start)(CCD){CCD}
21 \end{pspicture}

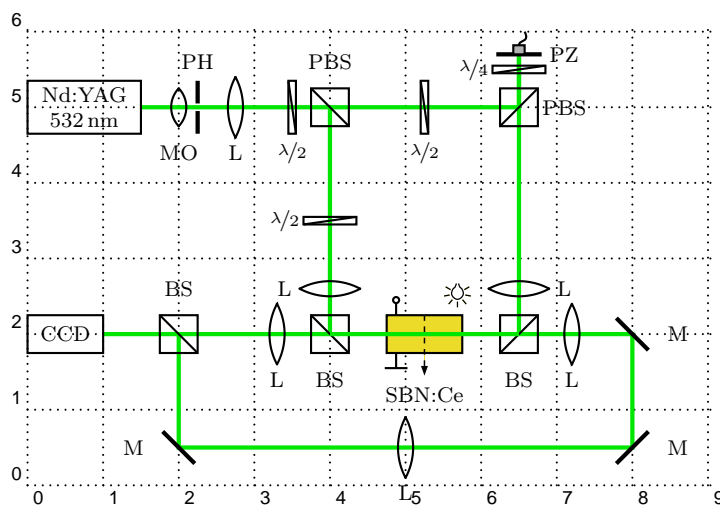
```



```

1 \begin{pspicture}(6,3.5)
2   \psgrid[subgriddiv=1,griddots=10,gridlabels=7pt]
3   \psset{labelstyle=\scriptsize}
4   \pnode(1.5,1){LaserOut}
5   \pnode(3,1){Grid}
6   \pnode(6,3){Out}
7   \pnode(4,3){Mvar}
8   \psline[linewidth=2\pslinewidth,
9     linecolor=red!90!black](LaserOut)(Grid)(Out)\psline(Grid)(Mvar)
10  \optbox[endbox,optboxwidth=1.5](Grid)(LaserOut){diodelaser}
11  \optretplate[position=0.3,
12    labeloffset=0.7](LaserOut)(Grid){$\nicefrac{\lambda}{4}$}
13  \optgrid[labeloffset=0.5](LaserOut)(Grid)(Out){grid}
14  \mirror[variable,
15    labelangle=20,
16    labeloffset=1](Grid)(Mvar)(Grid){variable mirror}
17 \end{pspicture}

```



```

1 \begin{pspicture}(9,6)\psgrid
2   \pnode(1.5,5){Laser}\pnode(4,5){PBS}\pnode(6.5,5){PBS2}
3   \pnode(6.5,5.7){piezo}\pnode(4,2){BSFwd}\pnode(6.5,2){BSBwd}
4   \pnode(2,2){BS4f}\pnode(2,0.5){M4f3}\pnode(8,2){M4f1}
5   \pnode(8,0.5){M4f2}\pnode(1,2){CCD}
6   \psline[linecolor=green!90!black,linewidth=2\pslinewidth]%
7     (Laser)(PBS2)(piezo)(BSBwd)(M4f1)(M4f2)(M4f3)(BS4f)(CCD)
8   \psline[linecolor=green!90!black,linewidth=2\pslinewidth](PBS)(BSFwd)(BS4f)
9   \psset{mirrorwidth=0.6, plateheight=0.7, owidth=0.7, labeloffset=0.6,
10    labelstyle=\scriptsize, lensheight=0.8, lenswidth=0.2, bswidth=0.5}
11   \optbox[endbox,optboxwidth=1.5, optboxheight=0.7]%
12     (PBS)(Laser){\parbox{1.5cm}{\centering Nd:YAG\ 532\,nm}}
13   \lens[lensheight=0.5, position=0.2](Laser)(PBS){M0}
14   \pinhole[position=0.3, labelangle=90](Laser)(PBS){PH}
15   \lens[position=0.5](Laser)(PBS){L}
16   \optretplate[position=0.8](Laser)(PBS){$\nicefrac{\lambda}{2}$}
17   \beamsplitter[labelangle=90](Laser)(PBS)(BSFwd){PBS}
18   \optretplate[labelangle=180](PBS)(BSFwd){$\nicefrac{\lambda}{2}$}
19   \lens[position=0.8,labelangle=180](PBS)(BSFwd){L}
20   \optretplate(PBS)(PBS2){$\nicefrac{\lambda}{2}$}
21   \beamsplitter[labelangle=0](PBS)(PBS2)(piezo){PBS}
22   \optretplate[labelangle=180, abspos=0.5](PBS2)(piezo){$\nicefrac{\lambda}{4}$}
23   \mirror[mirrortype=piezo, labelangle=0](PBS2)(piezo)(PBS2){PZ}
24   \lens[position=0.8,labelangle=0](PBS2)(BSBwd){L}
25   \beamsplitter(PBS)(BSFwd)(BSBwd){BS}
26   \beamsplitter(PBS2)(BSBwd)(BSFwd){BS}
27   \crystal[crystalwidth=1, crystalheight=0.5, voltage, lamp, fillstyle=solid,
28     fillcolor=yellow!90!black, labeloffset=0.8](BSFwd)(BSBwd){SBN:Ce}
29   \mirror[labelangle=0](BSBwd)(M4f1)(M4f2){M}
30   \mirror[labelangle=0](M4f1)(M4f2)(M4f3){M}
31   \lens(M4f2)(M4f3){L}
32   \mirror[labelangle=180](M4f2)(M4f3)(BS4f){M}
33   \beamsplitter[labelangle=90](M4f3)(BS4f)(CCD){BS}
34   \optbox[endbox](BS4f)(CCD){CCD}
35   \lens[abspos=0.7](BSFwd)(BS4f){L}
36   \lens[abspos=0.7](BSBwd)(M4f1){L}
37   \psline[linecolor=green!90!black, linewidth=2\pslinewidth](BSFwd)(BSBwd)
38 \end{pspicture}

```

4 Known bugs

For some reason, filling of the concave lenses by specifying `fillstyle` does not work properly. For sure there are other bugs, but they are not known, yet. If you find some, do not hesitate to contact me.

5 Todo

- Add components for fiber optics.

Drawing of extended beams with focusing, and so on, is not planned to be integrated in the near future due to missing ideas for the realization.