# TeXlattice - draw accelerator lattices with LaTeX
## *using pgf/tikz*

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## Contents



# 1 Installation

## 1.1 Copy lattice.sty

You just need to copy the lattice.sty file to a place where your LaTeX installation can recognize it. This can be

- the same folder as your .tex document
- in the LaTeX system tree (e.g. for texlive under ubuntu *usr/share/texmf/tex/latex...*)

- in a LaTeX user tree

Read the documentation of your LaTeX distribution for details.

### 1.2 Required packages

- tikz, pgf
- siunitx
- ifthen
- xargs

## 2 What is missing?

- The look of the elements can definitely be improved. Feel free to do it! The only constraint is that it must be drawn as a tikz node.
- More element types can be added easily - please report what you need!

## 3 lattice environment

To draw a lattice just add

```
\usepackage{lattice}
```

to your preambel and use the lattice environment. the lattice environment has 4 optional arguments:

1. `[tikz options]` give any options for the tikzpicture (e.g. overlay)
2. `[scale]` scale whole picture (default: 1)
3. `[label fontsize]` text label fontsize (default: `\normalsize`)
4. `[label distance]` distance of text labels to elements (default: 1cm)

## 4 Within lattice environment

### 4.1 Elements

- `\drift{length/m}[name (default: none)]`
- `\dipole{name}{length/m}{bending angle/deg}[thickness/m (default 0.4)]`

- `\quadrupole{name}{length/m}[thickness/m (default 0.5)]`
- `\sextupole{name}{length/m}`
- `\kicker{name}{length/m}`
- `\cavity{name}{length/m}`
- `\source{name}`
- `\screen{name}`
- `\marker{name}[length/m (default 0.35)]` a line perpendicular to beamline of given length

### 4.2 Other commands

- `\rotate{angle/deg}` "bends" the beamline. e.g. to set starting angle
- `\shiftlabels` moves labels to other side of elements (swap with marker labels)
- `\start{coordinate/m}` sets starting point of lattice. use before first element coordinate in form (x,y) or any tikz label, e.g. (mylabel.east) hint: use with `\savecoordinate` to connect lattices! (compile twice!)
- `\drawrule{start coordinate/m}[tick distance/m (default: 1)]` a rule to visualize lattice size. coordinate in form (x,y) or any tikz label, e.g. (mylabel.east)
- `\setdriftcolor{color (default black)}` for all following drifts
- `\setmarkercolor{color (default red)}` for all following markers
- `\setelementcolor{type}{color (default depends on type)}` define color for one element-type

### 4.3 Access lattice coordinates to add sth. manually or connect lattices

- `\savecoordinate{name}[position (default: east)]` saves coordinate of previous element to access it later.
  - position specifies the exact place of the element (north, center, south west, ...). Here east is always downstream and west upstream.
  - you can use all tikz/pgf commands within lattice environment to draw anything.
  - You can also connect multiple lattices. use tikz overlay option (1. argument of lattice) and `\start`. See example 3.
  - ! DON'T use bare numbers as names (e.g. (1)) These are the internal element identifiers.

# 5 Remarks

- lengths are set in meter, so you write {1.32} for 1.32m.
- picture scale: for lattice scale=1 an element of 1m length is plotted with 2cm length
- minimum element length 0.01m (drifts can be shorter)
- maximum drift length <2.9m (just add a second drift to get a longer one)
- if you refer to a coordinate from another lattice (another tikzpicture) you have to compile twice