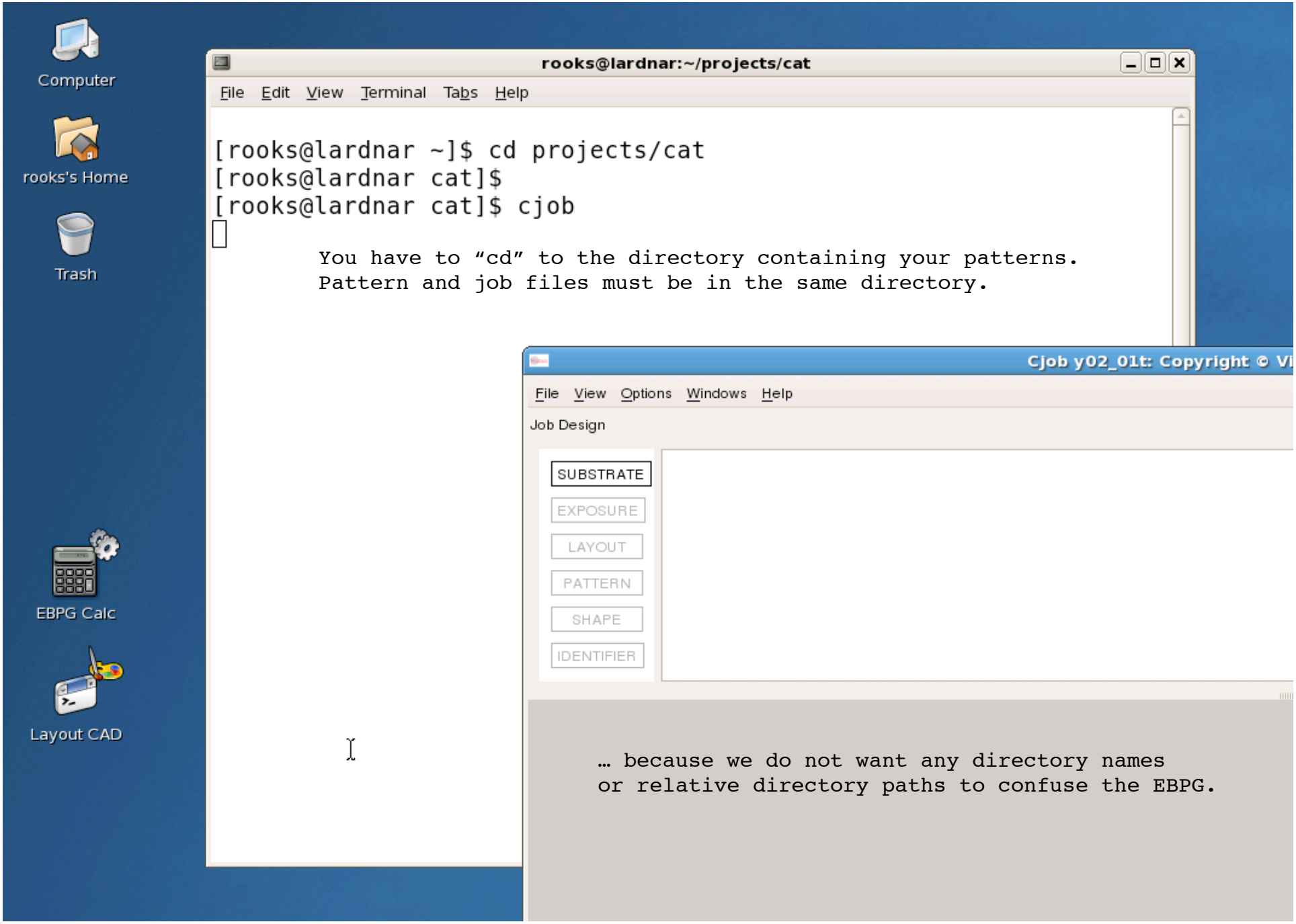
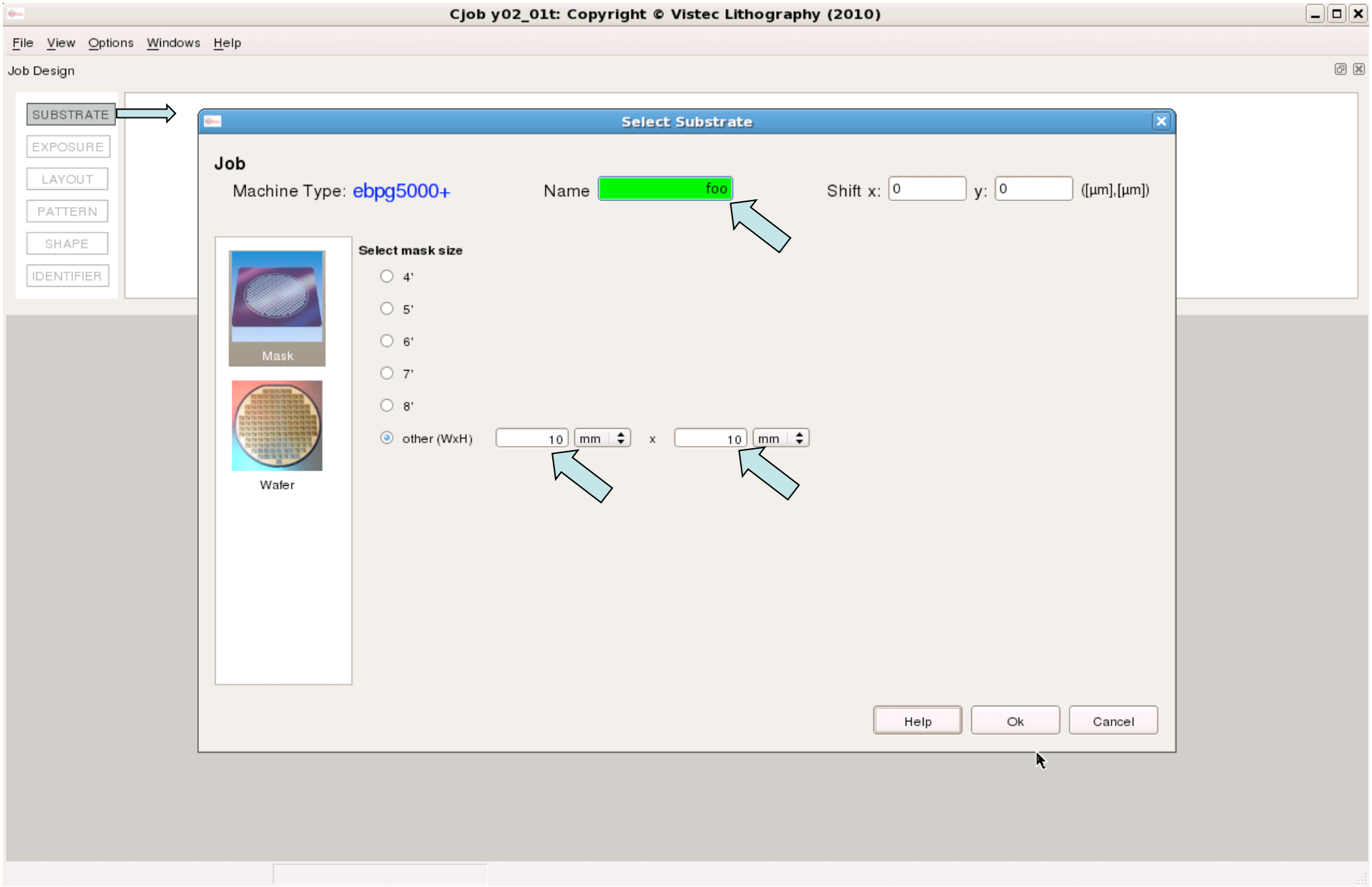
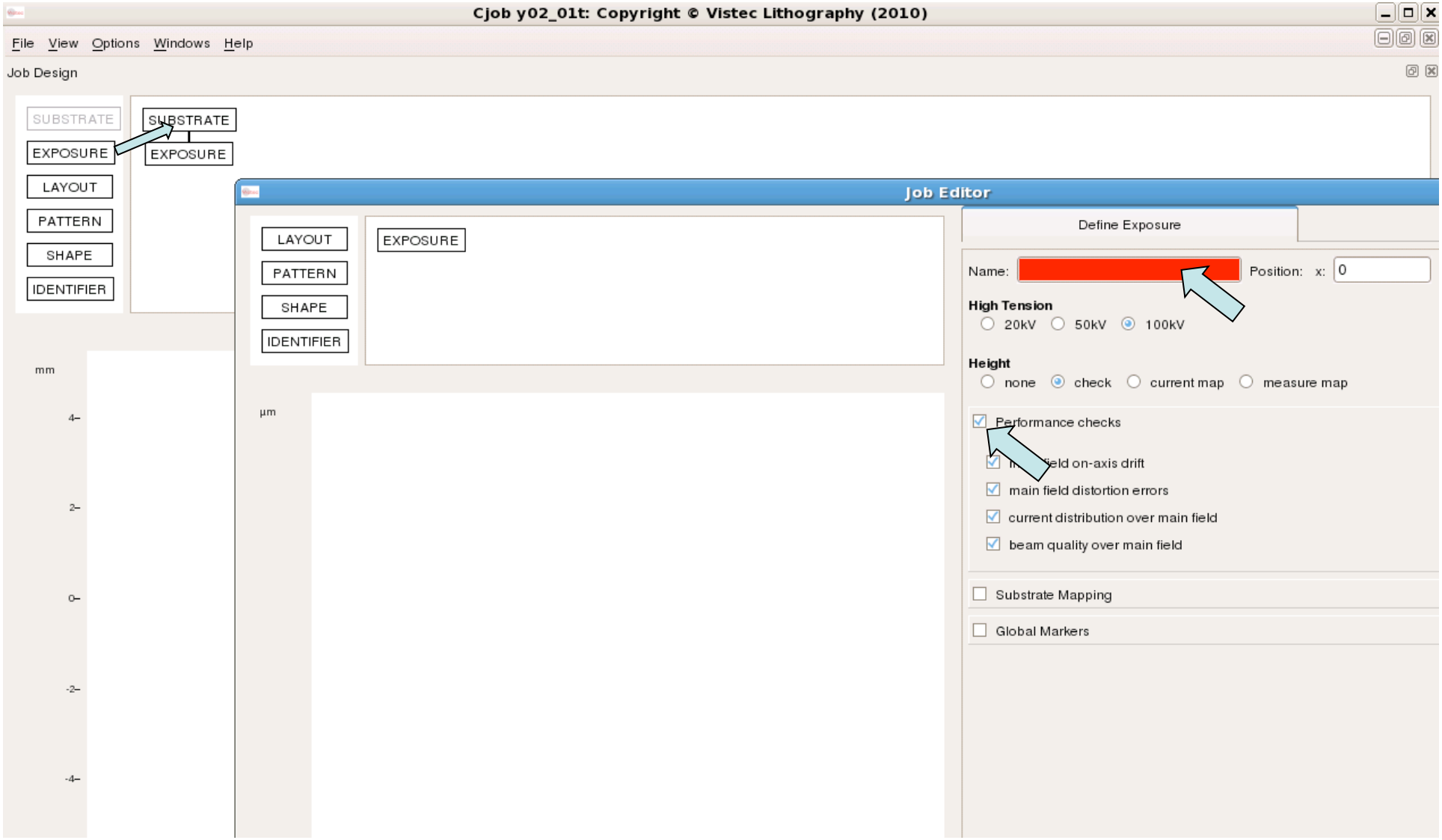
Cjob

Setting up exposure jobs

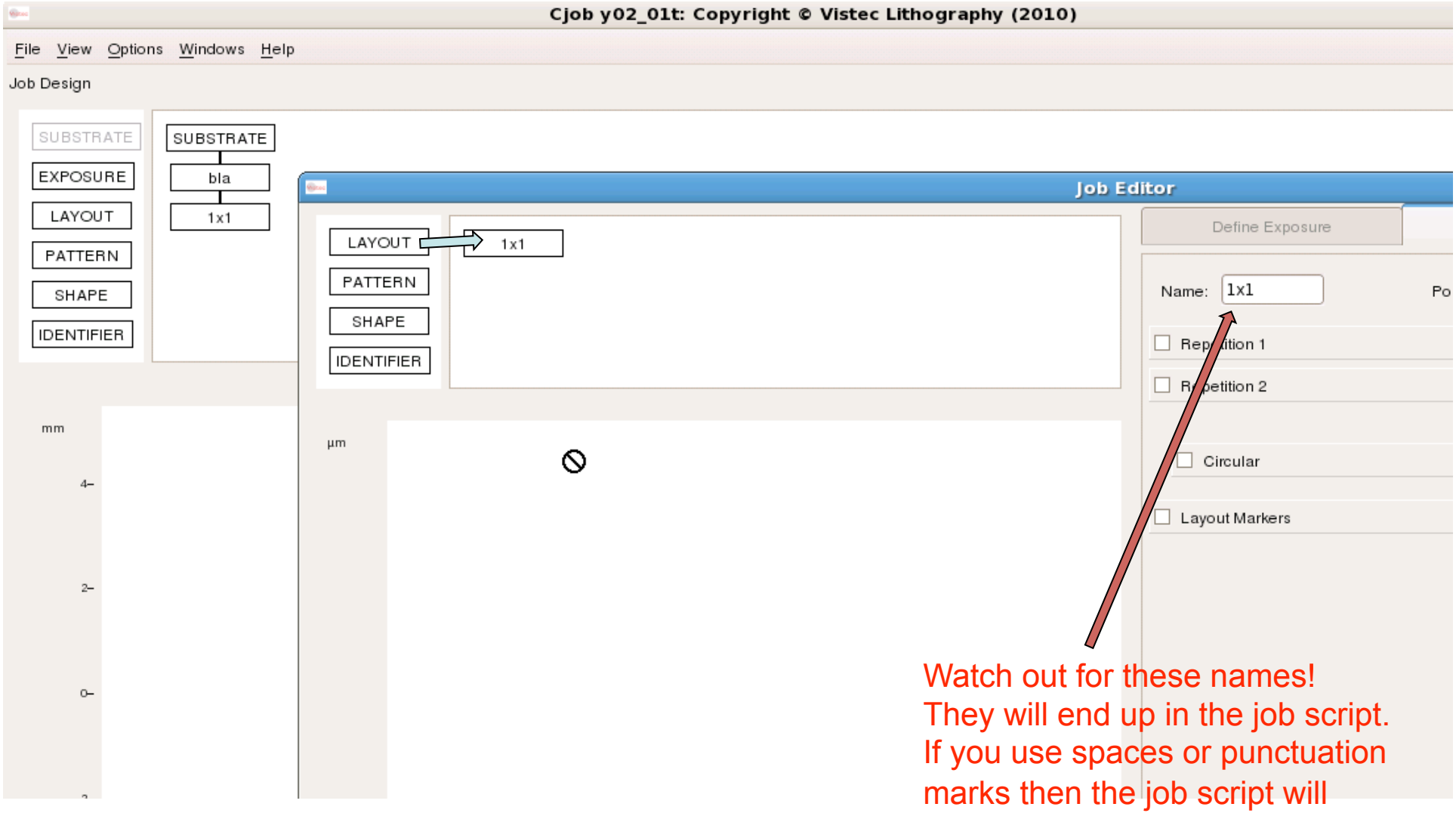

Computer
rooks's Home
Trash
EBPG Calc
Layout CAD
rooks@lardnar:~/projects/cat
File Edit View Terminal Tabs Help
[rooks@lardnar ~]$ cd projects/cat
[rooks@lardnar cat]$
[rooks@lardnar cat]$ cjob
You have to “cd” to the directory containing your patterns.
Pattern and job files must be in the same directory.
Cjob y02_01t: Copyright © Vi
File View Options Windows Help
Job Design
SUBSTRATE
EXPOSURE
LAYOUT
PATTERN
SHAPE
IDENTIFIER
… because we do not want any directory names
or relative directory paths to confuse the EBPG.



Drag “substrate to the right, then fill out the dialog box with substrate size and job name.



Drag “exposure” onto the “substrate” module. Supply a name.
Turn off the perfomance checks.

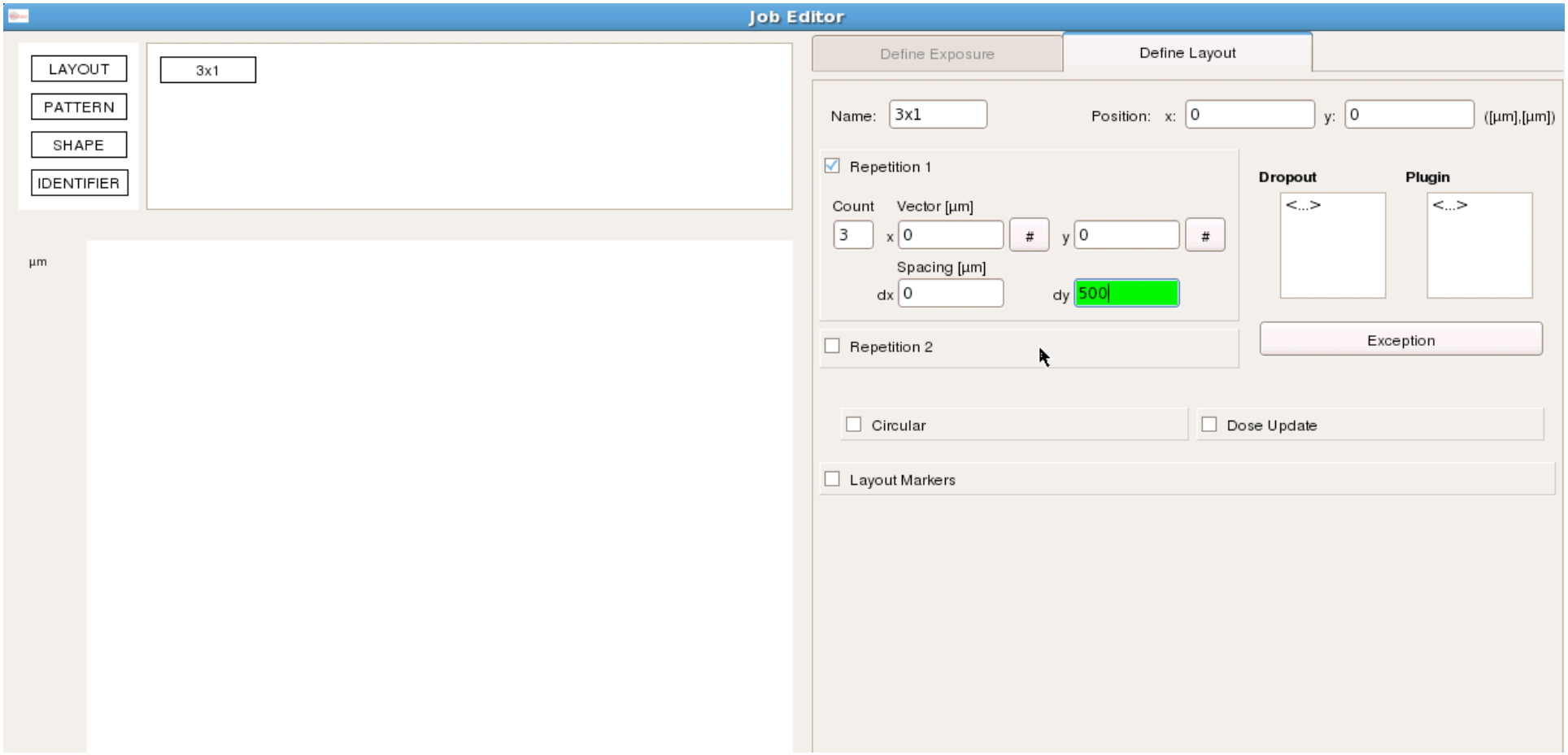


Watch out for these names!
They will end up in the job script.
If you use spaces or punctuation marks then the job script will fail in bizarre ways.

Drag “layout” onto the exposure box.

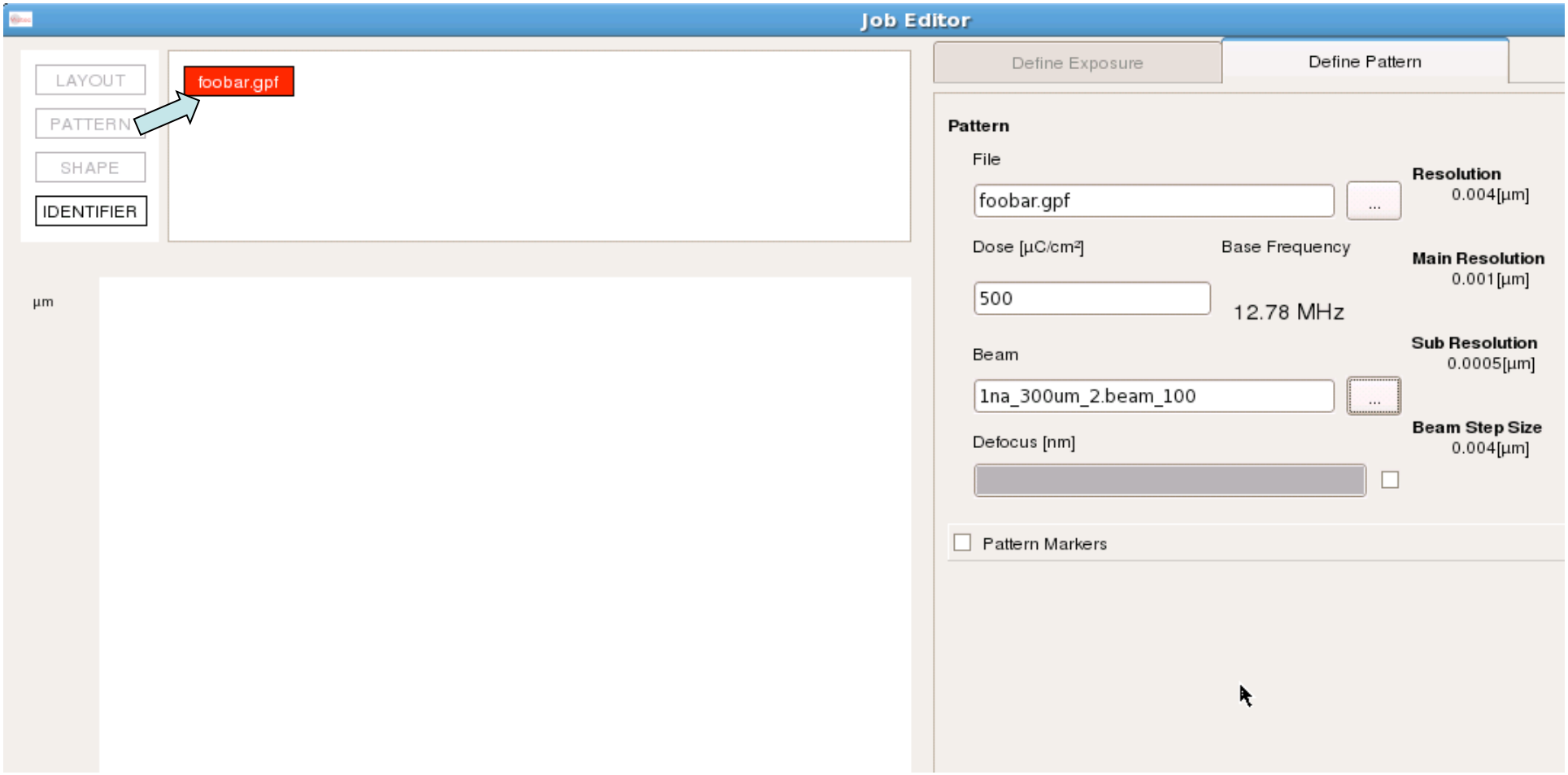
We are just moving down the list…

substrate… exposure… layout… pattern…

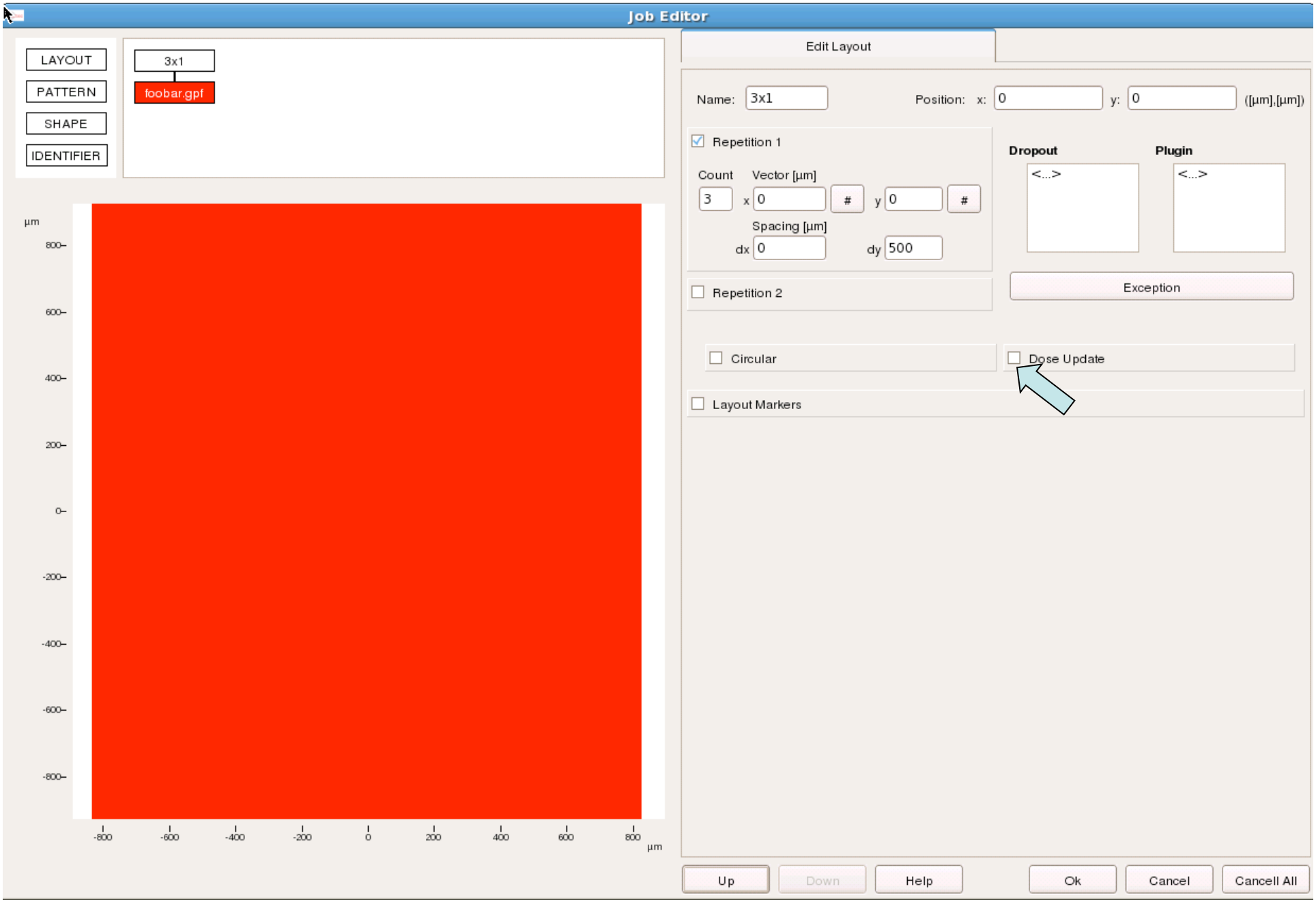


Fill out the number of repetitions and the spacing.
Or, move on to the “pattern” and leave this until later.

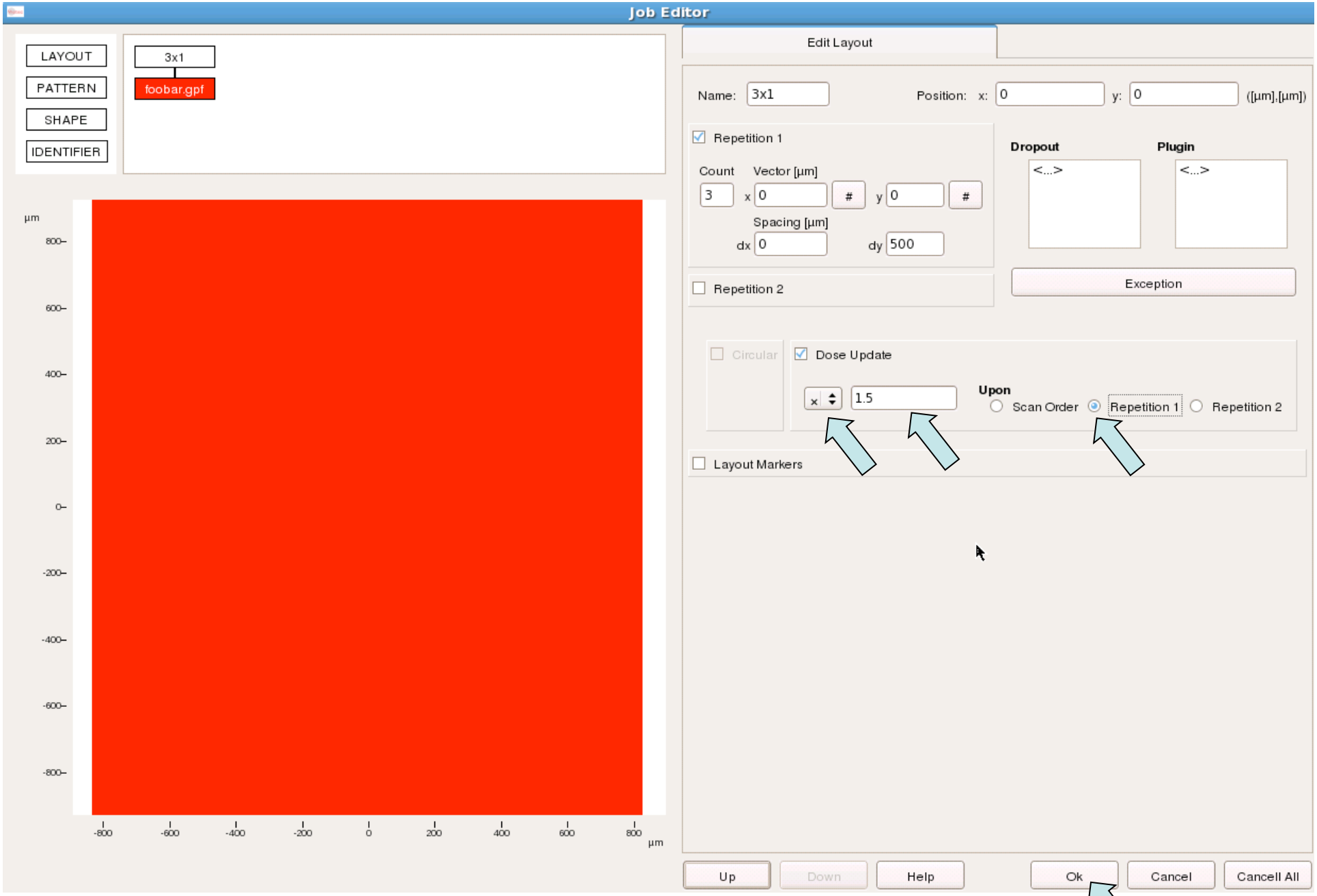
The “vectors” are always zero.

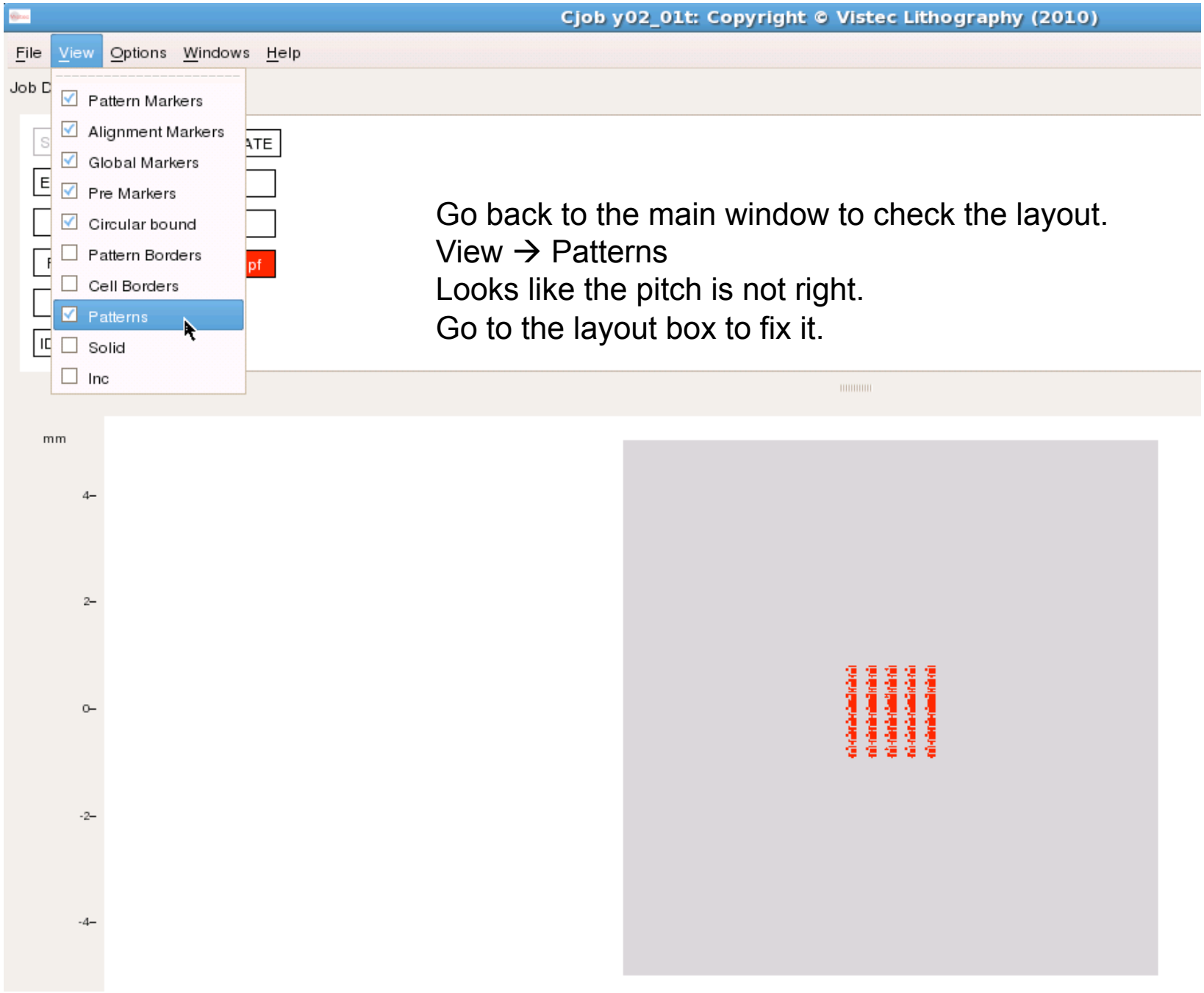


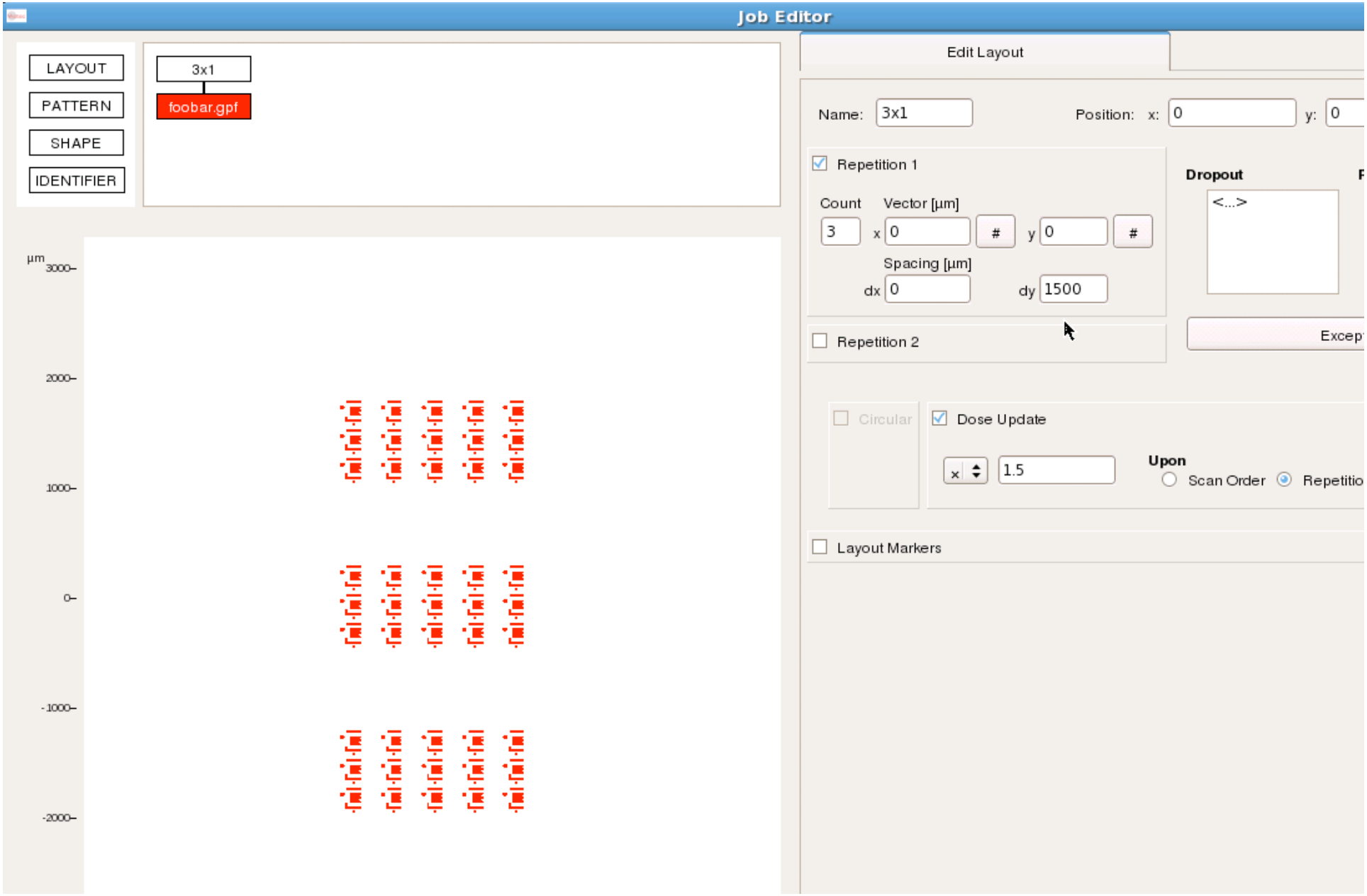
Drag a pattern onto the layout box, then select the pattern file, dose and beam (that is, current).
Notice that the program calculates the clock speed, which must be less than 50 MHz.
You don't always get the current you expect, so it's not wise to operate close to 50 MHz.



Let’s go back to the layout box “3x1” so that we can specify a dose update.


Job Editor
LAYOUT
PATTERN
SHAPE
IDENTIFIER
3x1
foobar.gpf
µm
800
600
400
200
0
-200
-400
-600
-800
-800
-600
-400
-200
0
200
400
600
800
µm
Edit Layout
Name: 3x1
Position: x: 0 y: 0 ([µm],[µm])
Repetition 1
Count
Vector [µm]
3
x 0
#
y 0
#
Spacing [µm]
dx 0
dy 500
Repetition 2
Dropout
<...>
Plugin
<...>
Exception
Circular
Dose Update
x
1.5
Upon
Scan Order
Repetition 1
Repetition 2
Layout Markers
Up
Down
Help
Ok
Cancel
Cancell All

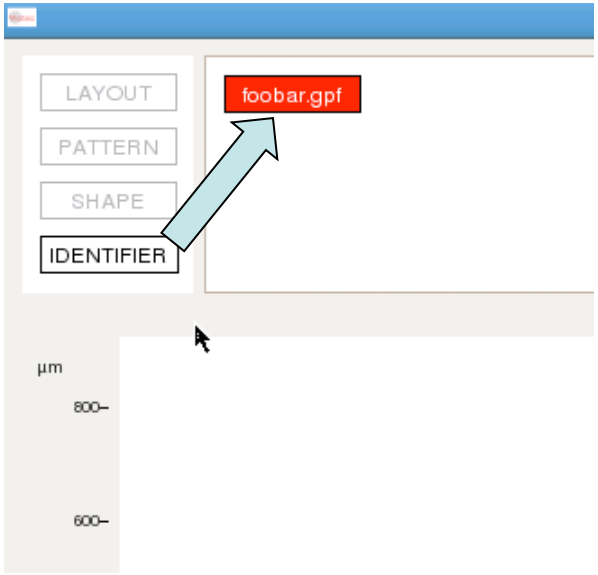

Cjob y02_01t: Copyright © Vistec Lithography (2010)
File
View
Options
Windows
Help
Pattern Markers
Alignment Markers
Global Markers
Pre Markers
Circular bound
Pattern Borders
Cell Borders
Patterns
Solid
Inc
Go back to the main window to check the layout.
View → Patterns
Looks like the pitch is not right.
Go to the layout box to fix it.
mm
4
2
0
-2
-4

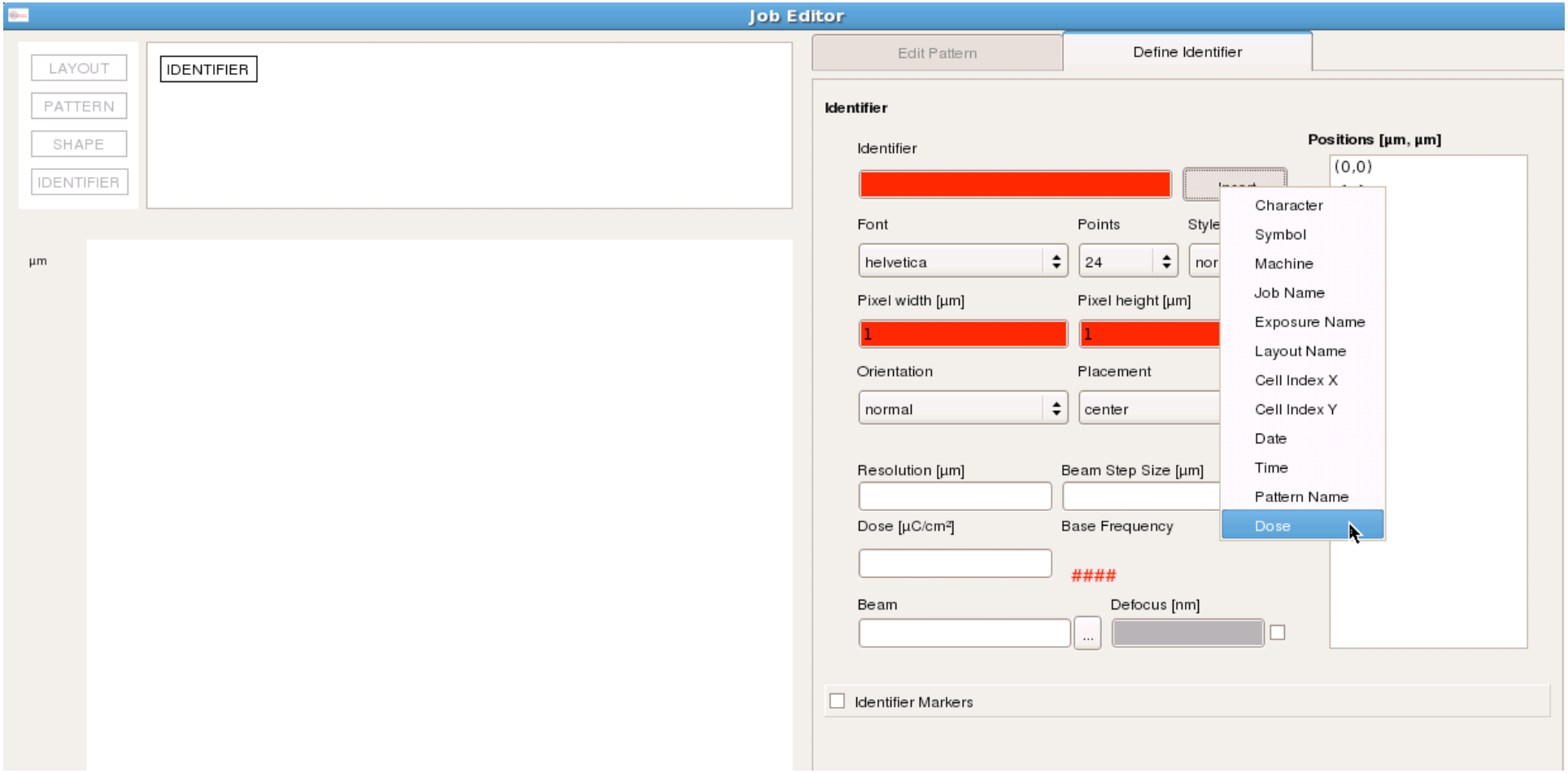


Change dy to 1500 µm so that the exposures do not overlap.
Note that zoom in/out uses the same convention as Cview and Beamer.

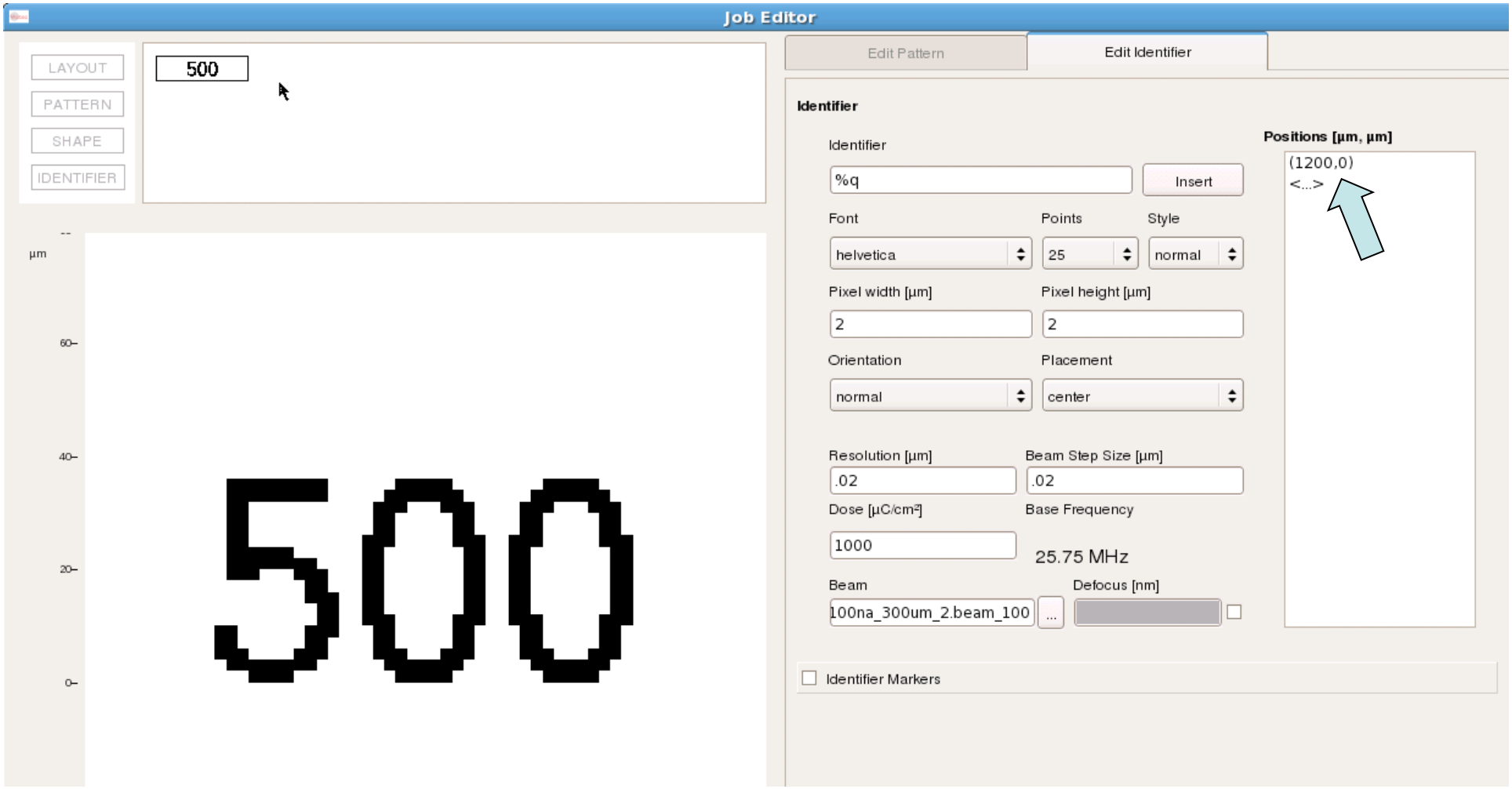
Let’s label each exposure with the dose.

Go to the pattern box, and drag an “identifier” onto the pattern.





Insert the “dose”, and erase the useless “µC/cm^2” bit.
Choose a font size, pixel size, resolution = beam step, dose and beam (current).
Note that the current can be very large.

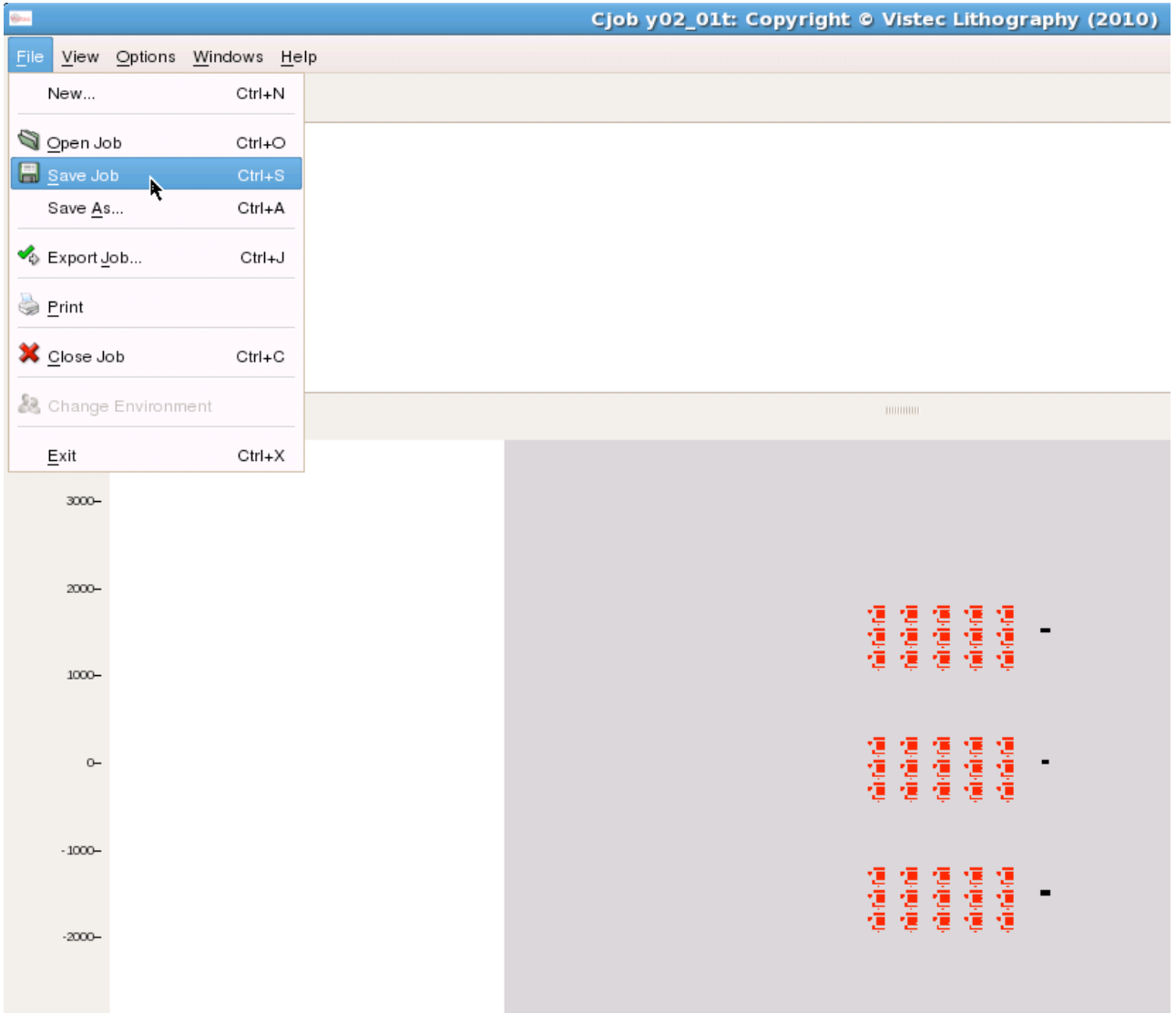


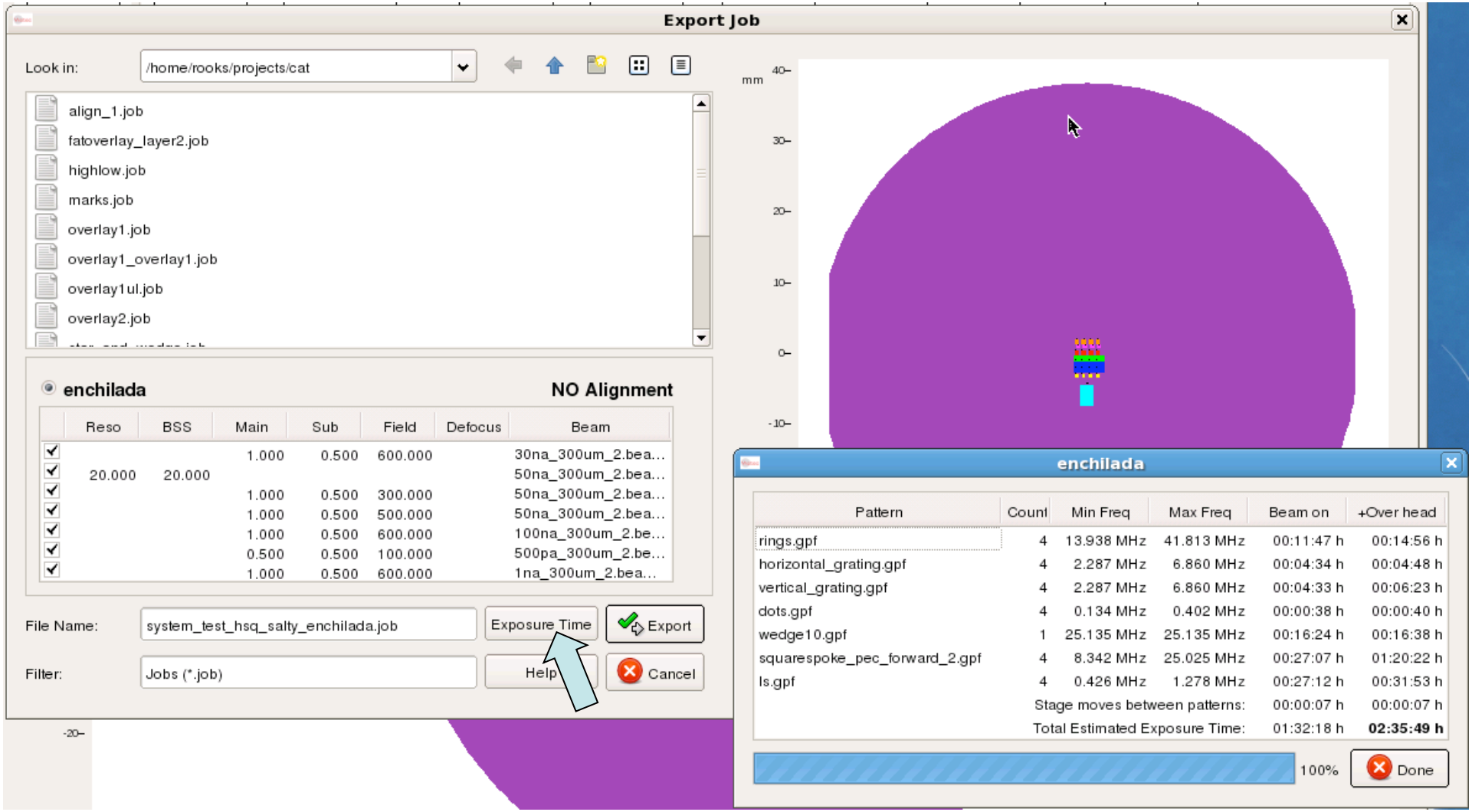
If the parameters result in a clock > 50 MHz, then the fields will be highlighted in red.

Set the position relative to the pattern's center. Check it out on the main window, and change the position vector if the label does not look good.

Back in the main window, save the job (as a .cjob file) and then export the job (as a .job file).

The .job file is the one that will be used for the exposure.





Calculate the expected exposure time from the “Export Job” box.
This estimate includes stage move time and shape settling overhead.

Over on the EBPG, the exposure will be started with the command

```
whatever.job 1 0 70mm,77mm
```

where “1” is the wafer chuck number, “0” is the loader slot number, and the given coordinate is the center point of the exposure job.

Actually, we will use a little bash script to start the exposure, so you will not have to type in this line.

Alignment jobs

Alignment example

The pattern is repeated over a wafer.

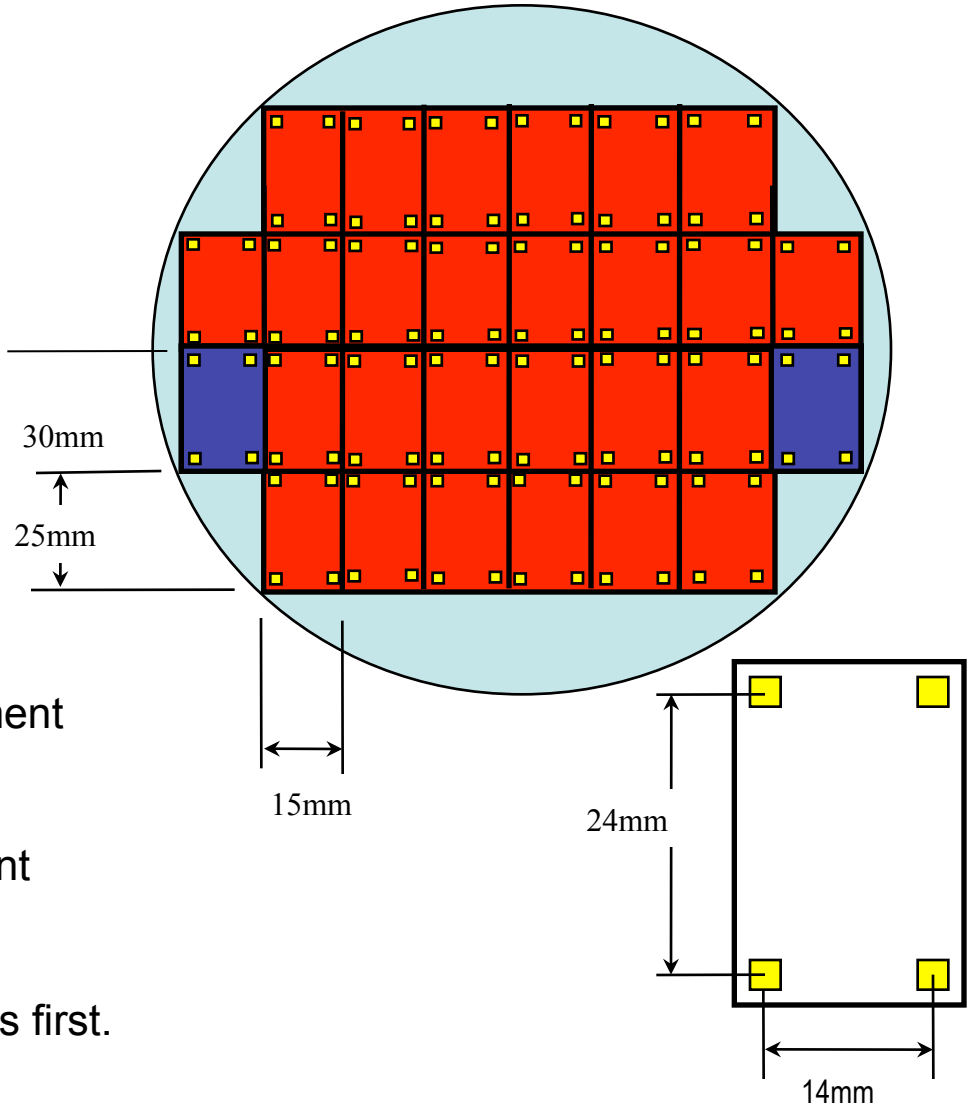
Alignment marks are first designed on
layer 1 and then printed
and etched (or liftoff)

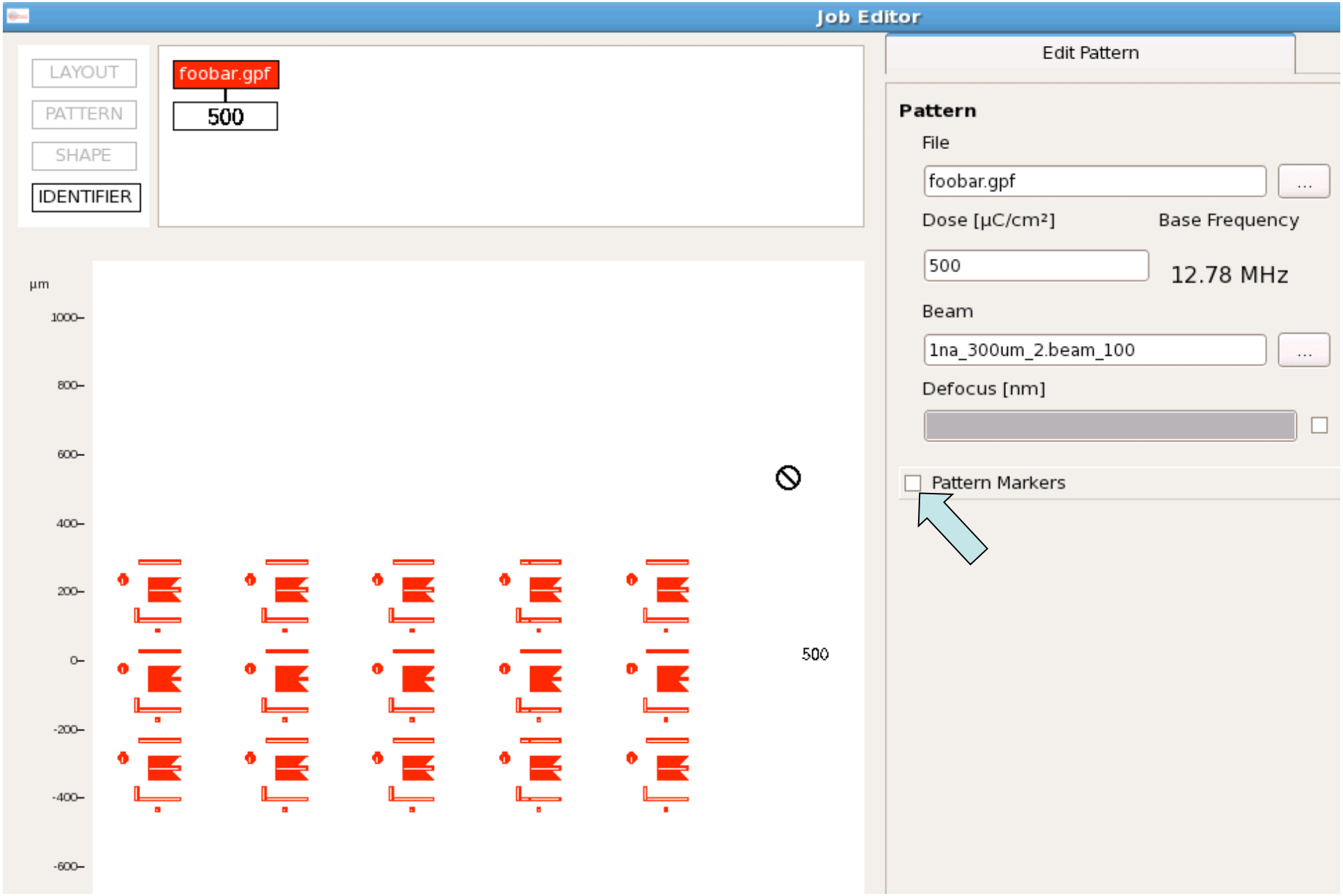
Each pattern or “chip” has four marks.

Three of these chip marks will be
used for initial “global” alignment

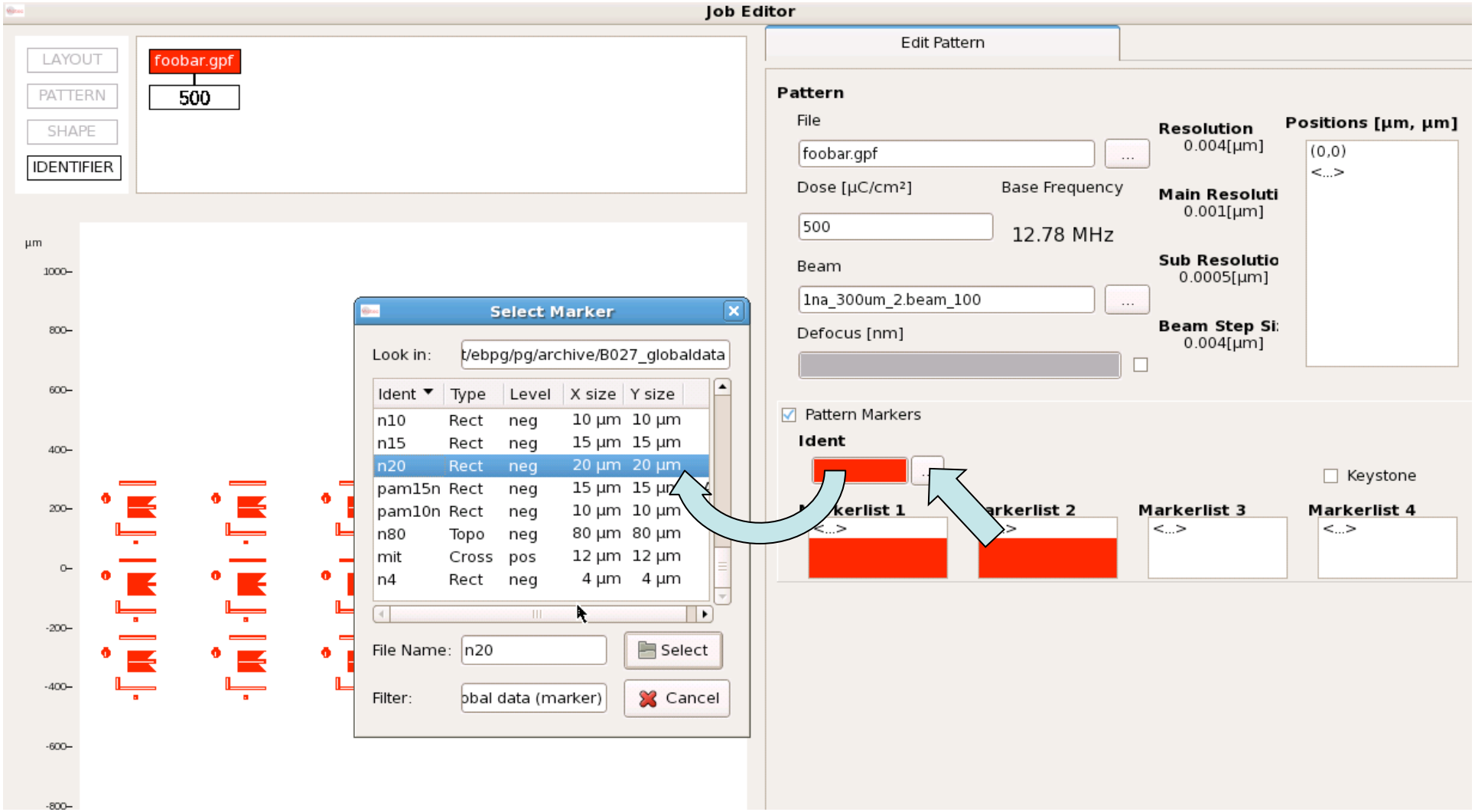
EBPG will first do a global alignment
and then local “chip” alignment

But when setting it up with Cjob,
it’s easier to work on the chips first.

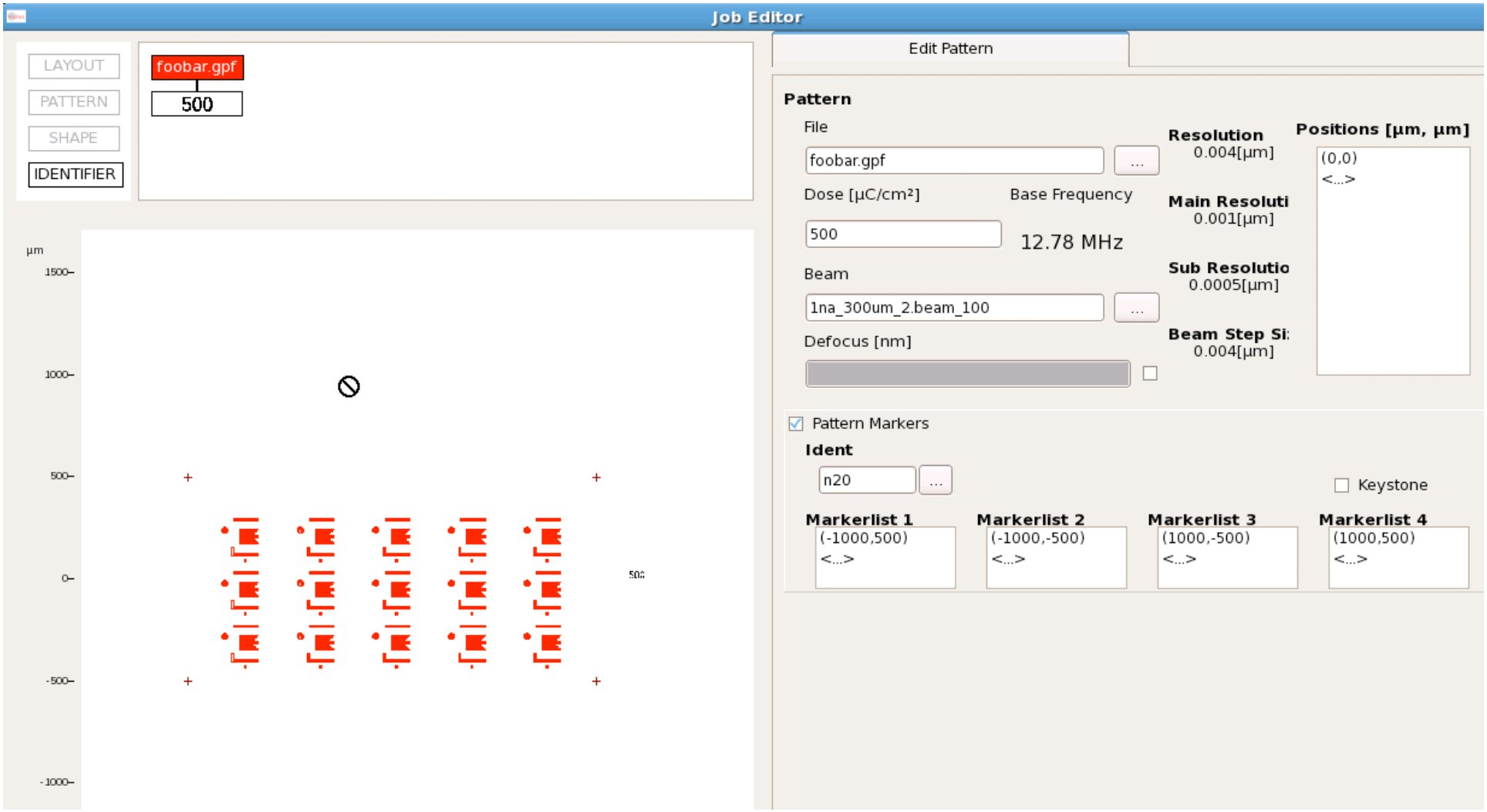




Start at the bottom: click on the pattern box, where we will set up pattern markers.

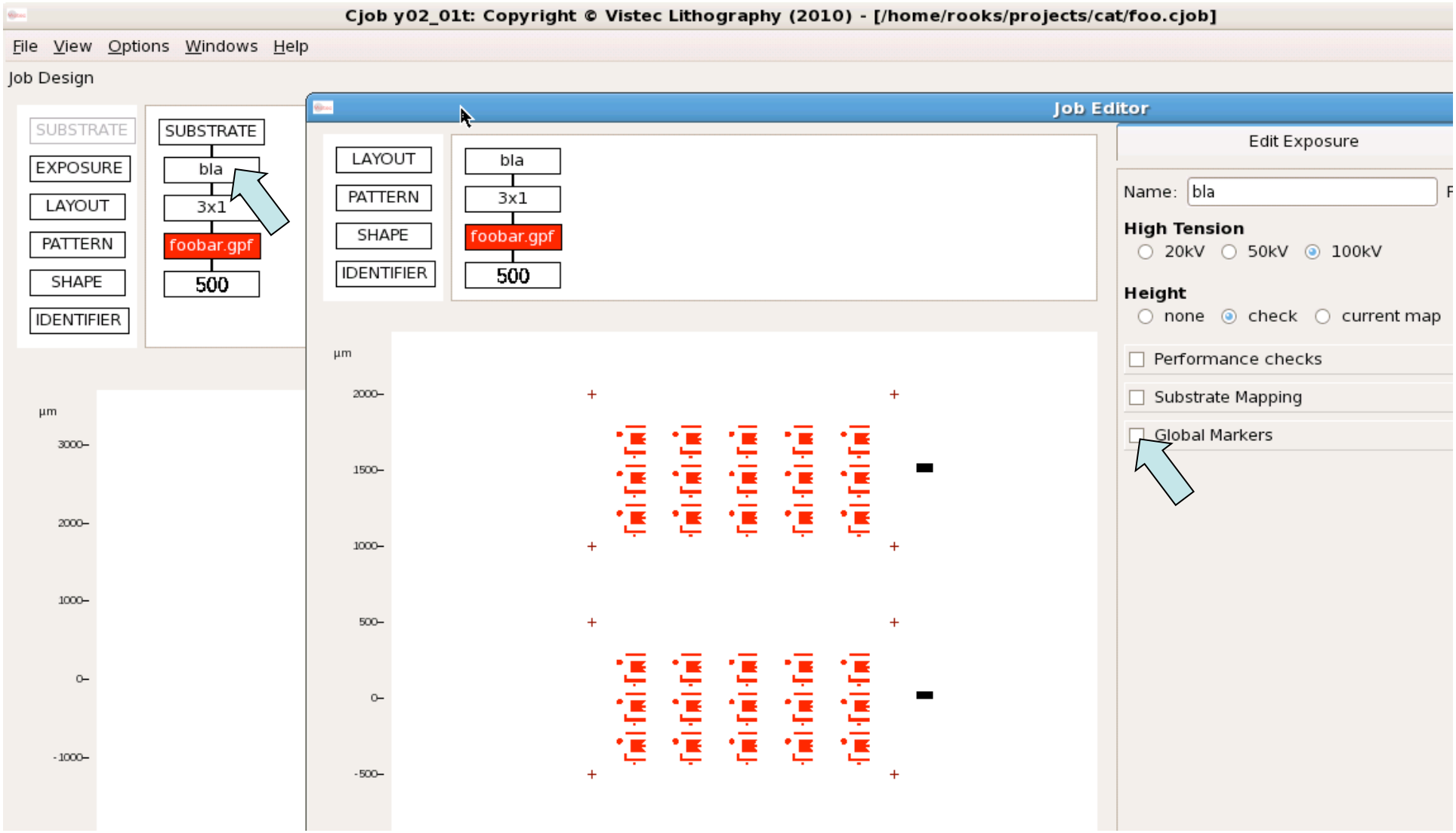


Choose an “ident” – that is, the name of the alignment mark.
This marker type has been defined previously on the EBPG.
If you do not see an appropriate mark definition, you can pick any mark and fix it later.
There is a simple command on the EBPG for defining new marks. Cjob will see the new mark after it is saved on the EBPG.

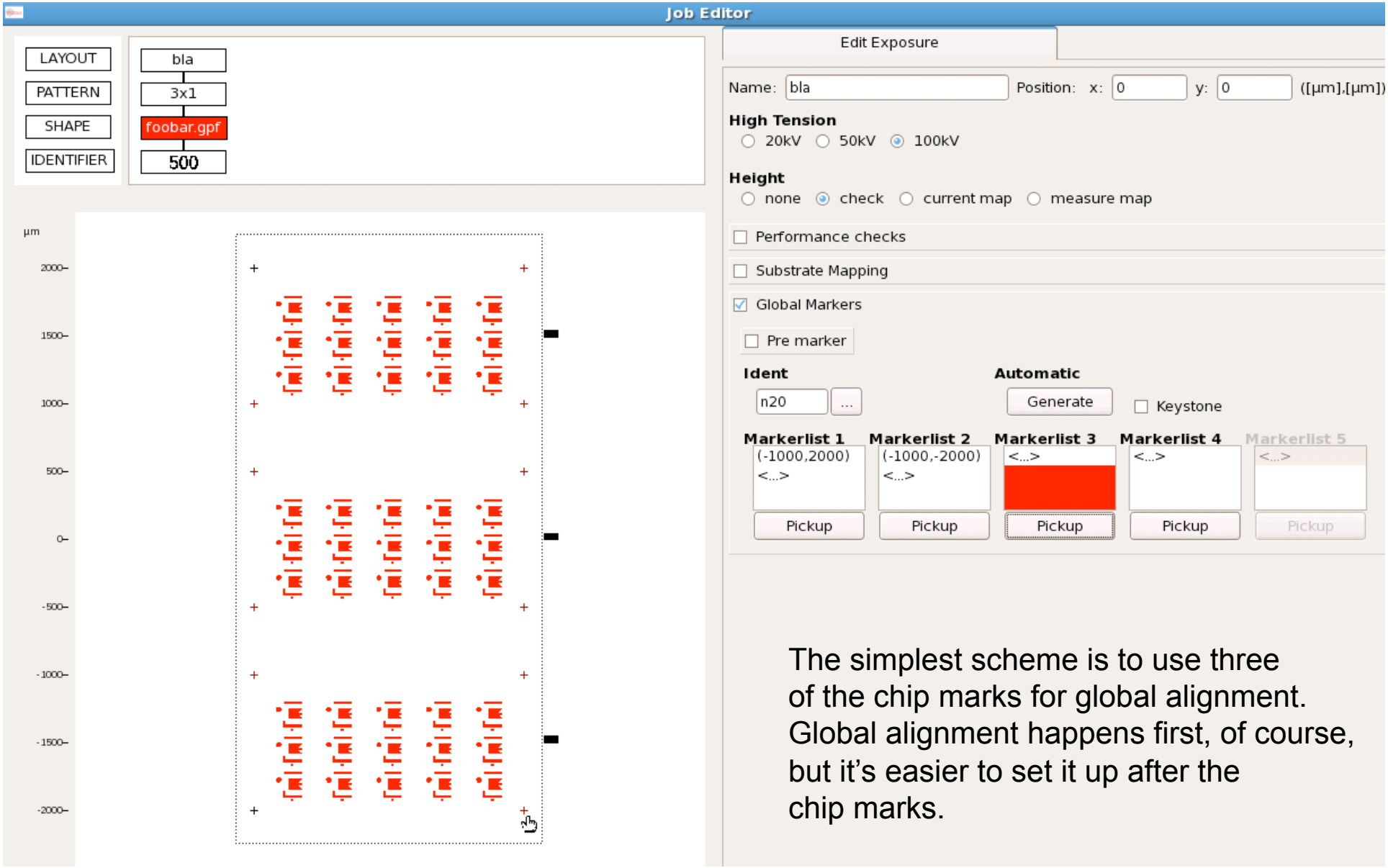


Type in the mark coordinates relative to the pattern's center. Go back to CAD to figure out the coordinates. Good thing you chose sensible, easy values!

Tip: If you include the mark layer along with your pattern layer (in Beamer) then it will be easy to check the alignment mark vectors. Later, go back and delete the mark layer.



Global alignment: go back to the exposure box (“bla”) and click on “global markers”.
Do not define alignment markers in the layout box (“3x1”).



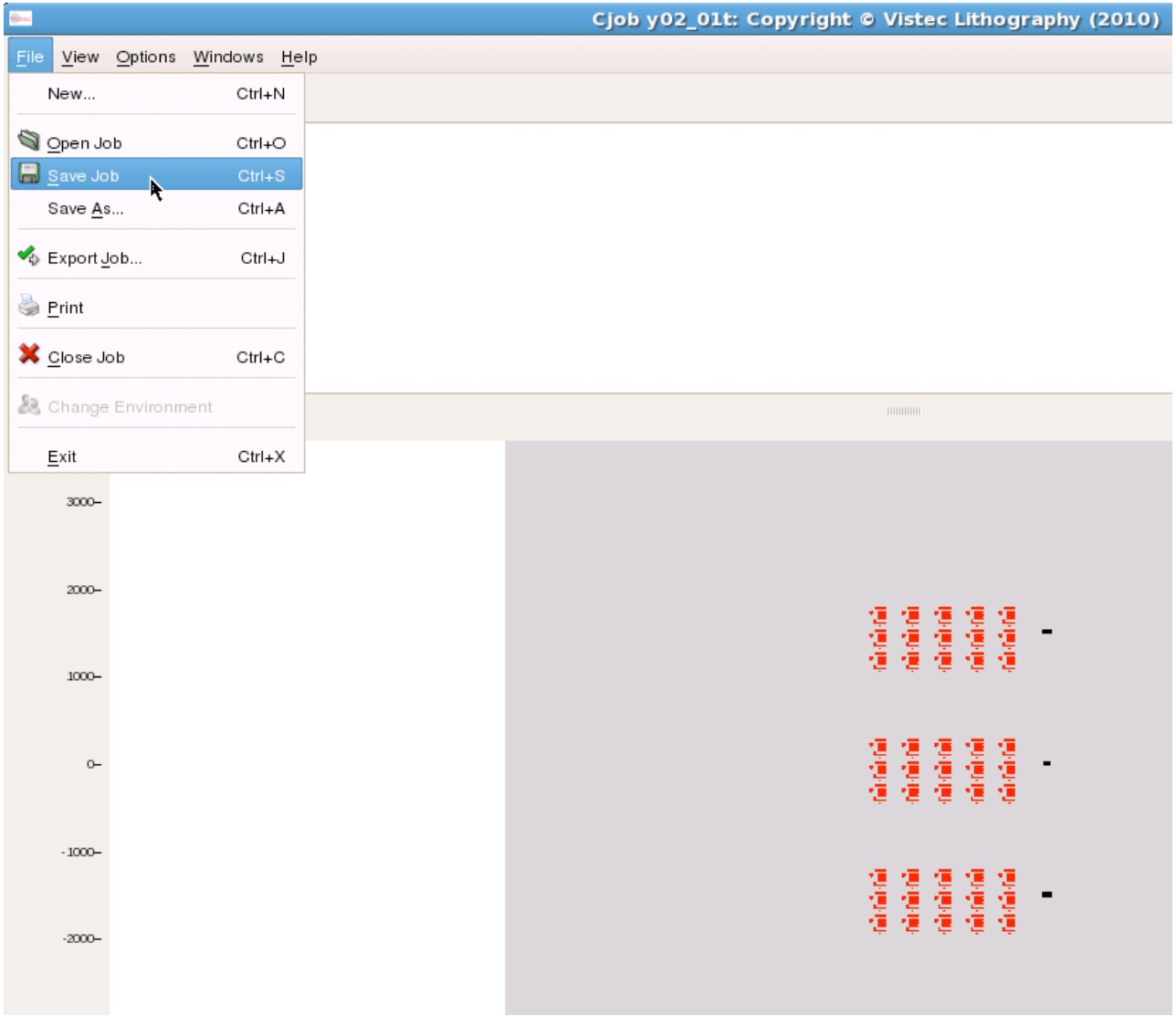
The simplest scheme is to use three of the chip marks for global alignment. Global alignment happens first, of course, but it's easier to set it up after the chip marks.

You can type in the vectors to the global marks, or you can "pick them up" by clicking on the appropriate chip mark. Actually, you have to click on "Pickup" and then choose the mark with <ctrl> click.

Save and Export
the job, as before.

Note the order
in which the global marks
were specified.

You will need to find
those marks in the
same order once you
are sitting at the EBPG
console.



Over on the EBPG, the exposure will be started with the command

```
whatever.job 1 0 $upper_left $lower_left $lower_right
```

where “1” is the wafer chuck number, “0” is the loader slot number,
and the rest are symbols containing the stage coordinates of the
global alignment marks. You’ll find the marks first, and save their coordinates
in these variables.

Actually, we will use a little bash script to start the exposure,
so you will not have to type in this line.

Things you cannot do with Cjob

Trap alignment errors

Cjob dies upon encountering bad marks

Changing anything other than the dose

Focus, for example

Reacting intelligently to problems

Such as losing the mark after switching current
or asking for user intervention

Alignment to nearly anything

Keep in mind that the EBPG can do image processing to align to nearly anything. If you can see it in SEM mode, then you can use it for alignment.

Low contrast material, strange shapes, badly broken marks, silicon nitride windows…

Image acquisition and correlation analysis can be used for alignment, but it's not covered here.