

EBPG CHEAT SHEET

0. Check the high voltage with

```
pg get htval
```

It should be around 100kv. If not,
please report the problem and go home.

1. Load the substrate in a holder. Check that the substrate and/or piece holder are pressing against the three points. *Optionally*, use the alignment microscope to measure the vector from the Faraday cup to a focus point (e.g. colloidal gold).

2. Start pumping the load lock and then

```
subl n
```

where n=1 for the mask holder, n=3 for the 3
inch wafer holder, n=6 for the six-inch wafer
holder, n=4 for the four-inch wafer holder.

3. Select holder with

```
pg sel hol n
```

(where n=1, 3, 4, or 6)

4. Load the column conditions

Show the list of beam files for different
currents, then restore those conditions

```
pg info arc beam
```

```
pg arc restore beam <file>
```

Note that the system switches and aligns the
apertures automatically. On systems with a

manual aperture changer, you should use
"pg adj ap"

5. Find the calibration mark

mvm

Watch the SEM screen to see the detection
sequence

Adjust table coordinate- shift the stage origin

IF mvm WAS SUCCESSFUL THEN

atc

ELSE

ask for help

because if you atc

at some random place

then the system will

be very screwed up

OR

use "mhome" to reset coordinates

6. Measure the current with

mcur

If the current is very different from the desired
value, then something is wrong and you should
ask for help.

7. Choose your pattern

pg sel pattern <file>

Hopefully you have already used "cd" to set the
default directory under /home/pg/users/

8. *Optionally*, set the resist sensitivity

```
pg set resist <lowest-dose>
```

This will avoid warning messages about the clock rate. It's not really important.

10. Calibrate the field size, focus, etc with

```
pg adj ebpq
```

or "aeb". This sequence ends at the Faraday cup.

11. OPTIONAL: Check the auto-focus function by moving to a blob of colloidal gold, or simply check the substrate height:

```
mvr1 <dx>,<dy>
```

for example, `mvr1 45mm,32.87mm`

Move to a good looking blob and check the focus with

```
afla
```

You might want to save the location with

```
sp foo
```

or any name you like, other than "foo"

Later, you can move back to this location with

```
mvsp foo
```

12. Move to where you want the center of your layout then save that location

```
sp start
```

Or you can type the stage coordinates directly into the wrapper script (see next step). It would be smart to turn off the SEM view so that you will not expose the resist.

13. Create a wrapper script for running your job. You could copy an example:

```
cp /public/wrapper.sh whatever_name_you_like.sh
```

Edit this file with emacs, kate or gedit
(or with vi if you are a freak)

If you copied an example then you **do not** have to make the script executable with

```
chmod a+x whatever
```

If you are using the symbol “start” in the wrapper script, be sure to move to where you want the center of the layout, then save the location

```
sp start
```

14. Start the exposure with

```
./whatever_name_you_used.sh
```

15. Unload the substrate

```
subu n
```

Be sure that the load lock is pumped out first.
If you vent the load lock before 'subu' then an
annoying alarm will sound.

16. Leave the holder in the loadlock and leave it pumping.

IF YOU LOAD ANOTHER WAFER then you can skip nearly all of this procedure.
Just load the wafer with "subl" and run your wrapper script again.

MOST of this procedure is for checking that the tool is running properly before
you start the exposure. If the EBPG is not working, it's best to know this *before*
wasting a lot of time.

UNIX COMMANDS YOU SHOULD KNOW

| | |
|------------------------------------|---|
| <code>cp from_file to_file</code> | copy the file "from_file" to the file "to_file" |
| <code>mv from_file to_file</code> | move, that is, rename a file |
| <code>mkdir <name></code> | make a new directory (folder) |
| <code>cd <name></code> | change directory (change the default folder) |
| <code>pwd</code> | print working directory |
| <code>ls</code> | list files (directory), minimal information |
| <code>ll</code> | list files, with lots of information |
| <code>emacs <name></code> | text editor (or use kate, gedit) |
| <code>which <command></code> | show where this command comes from |
| <code>man <command></code> | show the manual page for this unix command |

Unix tips:

- . means "here"
- .. means "up one directory level"

- & after a command causes the command to run in the background
freeing the terminal for other commands

Do not use spaces in file names.

For file names, UseOnlyLetters_num3r5_underscore-dash.and.dot,
but be sure to begin and end the name with either a letter or a number.

Create a new directory (with "mkdir") for each project.

You **MUST** put the pattern file in the same directory as the cjob file.

OTHER HANDY EBPB COMMANDS



pgreset

pg move pos <x>,<y>

manual_focus

pg adj freq

height_map.sh <size_mm>

pg marker calib <x>,<y>

mvm 0,0 --rel marktype

pg set stagelock 0

pg marker create rec pos 8,8 foo

\$pg save

pg marker set p10 contra 99

pg marker reset p20

pg get htval

restore_symbols

pg table /del "*"

findmark

testrot

mhome

reset system after crash or freeze

move somewhere

adjust focus & stig manually

calculate exposure clock

height map centered here

use alternate mark for calib.

align to mark right here

unlock stage

define new mark type

must follow marker create

*require the least contrast for
marker type "p10"*

*reset the filter settings which
were 'learned' previously for
marker type p20*

display high voltage value

*restore stage coordinate
symbols after losing the
terminal window*

delete all position symbols

*find and register the position
of the holder mark, even if
it is far from the expected
location*

*measure the rotation of
your substrate using two
alignment marks*

*move stage to 'home' position and
reset coordinates*

WAFER CENTERS ON THE EBPG5000

See other sheet for location symbols for the EBPG5200 holders.

4 inch and 6 inch wafers: 74.5mm,77.3mm

3 inch wafers: 71.0mm,77.5mm

