

e-Beam Litho on the Leica SS440 SEM run summary: updated 9-25-96

Spin on PMMA and bake as per nano-fabrication directions.
Load sample into SEM and pump to less than 5E-6 torr.

Run Up

Open up the gun window (flashlight icon) and roll back the filament target current by 0.10 amps. Run up the beam to 25 kV. You can probably just select "Beam On" from the upper right pull-down (the column isolation valve will need to be open). Fill in the log book.

Move to the gold standard, which should be at 0.0 rotation. Make sure the stage Z is at 12.8 mm and that the Conjugate Position is at -172 mm (this will work for 35 kV too).

Hit F2 to run the magnet hysteresis routine.

Fine-tune Beam/Column Alignment

Set the beam current to 100 pA. Make sure you are in Optibeam Conjugate mode.

Roll the Faraday cup into view using the crank (CCW).

In Spot Mode, measure the actual beam current with the HP pA-meter. Set the filament current so that the measured current is 5-10% off it's peak. (60-70 pA typ)

Go to Emission mode, Optibeam Conjugate Mode, Focus = 1mm (any out of focus)
Adjust Gun Tilt until the brightest part of the filament is at the center of the crosshairs.

Go to Emission mode, Optibeam Depth Mode, Mag = 1 (lowest)
Adjust Gun Shift until the oval is centered w.r.t. the crosshairs.

Go to Normal mode, Optibeam Conjugate Mode.
Refocus at a Mag of 25-30X (focus should be about 11.1 mm).
Hit Focus Wobble. Adjust final aperture until there is no lateral wobble.

Focal Plane Determination and Writing

If you need to align to previous patterns, the easiest thing to do is to use a feature on one of these patterns to focus on, and then enter in the offset to the writing positions (FOCUS2 or FOCUS2B programs). One can also use three arbitrary focal points (FOCUS3 program) such as silver paint specs.

Move to your sample, set stage Z to 14.8 mm (focus approx 11.1 mm)

Go to Lower Left (1), Upper Left (2) and Upper Right (3) focus features and find focal distance. Log these points as you go. Enter these points into a FOCUSxx program. Select the (A)rray command to use the (F)ocus points to determine the writing grid. Different FOCUSxx program versions compute this grid differently so watch out. Make sure to hit (S)ave and then e(X)it. The coordinates (X-Y-Z) are stored in text file FOCUS.DAT

You should verify that the writing positions are correct by going there with STAGE # where # is the position. Use the lowest Mag and the PMMA will not be exposed significantly. You can also double check the focus points using the STAGE F# command.

Do your final scheming and create your RUNXX.BAT file so that you are ready to go. Use DOT modifier if necessary to compensate for Mag Range shift.

Roll in the Faraday Cup (CCW) and get a final current reading. Use MRF to update your *.RF6 files with this value. While in MRF make sure the Mags match your RUNXX.BAT file.

Roll out the Faraday Cup (CW at least 10 turns). Make sure you are in Conjugate mode. Run STAGE F# and check your focus points. Re-enter changes using FOCUSxx. Run FW and make sure the network is alive.

Home Beam Shift. Ext Scan Control On. Column beam blank switch set to BLANK.
Sweat nervously. Did you miss something? Hit go.