

MEMS Beam Line operation:

### **A. Vent Chamber**

1. Close front end in order:
  - close Photon Shutter
  - close Radiation Shutter
  - close front end Valve
2. Close MEMS beamline in order:
  - close Valve 3
  - close Valve 2
  - close Valve 1
3. Open nitrogen bottle and nitrogen regulator valve
4. Open nitrogen shut off valve on beamline (below chamber)
5. Open Chamber Valve to half open position
6. Unscrew chamber door knob and move to open position
7. When chamber pressure is greater than 200 mT on the pressure gauge open Chamber Valve to full open position.

When chamber reaches atmospheric pressure the Chamber Valve will close.

1. Close nitrogen shut off valve
2. Close nitrogen bottle and nitrogen regulator valve

### **B. Prepare Sample**

1. Sample holders are stored in the bottom drawer of the tool box.
2. remove upper plate and screws from sample holder
3. Center sample PMMA strip (glued to sample) on back plate
4. Tape sample down using (minimize tape on sample).
5. Place spacers on both sides of the PMMA strip. The x-ray mask will rest on these spacers. Use enough spacers to obtain a height greater than twice the PMMA strip thickness
6. Place x-ray mask on spacers face down so that the pattern is centered on the PMMA strip.
7. **VERY CAREFULLY** place the upper plate onto the x-ray mask being sure the ceramic ring does not slip from the fixture. Also assure the screw threads in the back plate are aligned to the holes in the upper plate
8. Cover top opening with petri dish cover to protect the x-ray mask
9. Insert screws and tighten down all four screws evenly. These are set screws so tighten until impossible to tighten further. Do not apply excessive torque. When using thicker substrates these screws need not be tightened fully down
9. Tape phosphor strips to the upper plate above and below the pattern area to delimit the exposure area. A third strip to the handle side of the holder is sometimes helpful
10. Cover top opening with petri dish cover to protect the x-ray mask

### **C. Insert Sample**

1. Open chamber door
2. remove petri dish cover from assembly and insert sample holder into the dovetail slots. Insert until the dovetail slot fixture and the sample

- holder backplate are even. Turn the butterfly clip a half turn clockwise to push the sample holder flush to the chamber stage
3. Close chamber door and move door knob to close position and crank knob to obtain a good seal.

#### **D. Pump Down Chamber**

1. Turn on pump
2. Open Chamber Valve to half open position
3. When chamber pressure is less than 200 mT open Chamber Valve to full open. The beamline may now be opened to align exposure.

#### **E. Open Beamline**

1. Open MEMS beamline in order:
  - open Valve 1
  - open Valve 2
  - open Valve 3
2. Open front end in order:
  - open front end Valve
  - open Radiation Shutter
  - open Photon Shutter

#### **F. Align Exposure**

1. On computer select Set Up Exposure
2. Initialize stage
3. Reset table
4. Use stage jog adjust buttons to align beam to lower phosphor strip. The beam should be  $\sim 1/2$  on strip. Be sure to adjust stage left and right so entire pattern area is exposed
5. Click on Set Start Position
6. Use stage jog adjust buttons to determine throw
7. Set throw on table
8. Set scan speed on table ( $\sim 0.05$  or  $0.10$ )
9. Determine dose from tables in the beamline binder and set dose on table
10. Enable data and enter user initials when asked.

#### **G. Backfill**

1. Once pressure is  $\sim 3$  mT close Chamber Valve to half open.
2. Shut off pump
3. Open helium bottle and helium regulator valve.
4. Crack open helium shut off valve.
5. Once chamber pressure reaches 20 mT close Chamber Valve

#### **H. Begin Exposure**

1. On computer press start exposure
2. Log required data in log book

Once exposure is finished vent chamber as in A and remove sample holder. To remove sample from holder perform reverse of sample preparation (B).