## Appendix I. SOP for Photo Lithography Patterned Si Wafers

- 1. Wafer cleaning and photo resist coating
  - a. Clean the 4-inch Si wafer with Acetone, IPA, and water accordingly.
  - b. Blow dry the wafer with  $N_2$ .
  - c. Coat the wafer with HMDS (HexaMethylDiSilazane) using YES oven, using the default recipe.
  - d. Spin coat 1 μm thick photoresist Shipley SPR 3612 with 2 mm EBR (edge bead removal) without vapor prime using sygcoat (automatic track).
    - i. Recipe: 3612 1 µm w/o vp 2mm EBR.
- 2. Photo lithography (Heidelberg2)
  - a. Expose the photo resist coated wafers with 1.2 μm and 1.6 μm square array patterns with 2:1 spacing in between the squares.
    - i. Substrate template: Wafer 4 inch (Round shape).
    - ii. Layer: FirstExposure only.
    - iii. Laser wavelength: 375 nm.
    - iv. Dose: 118. v. Defocus: -3.

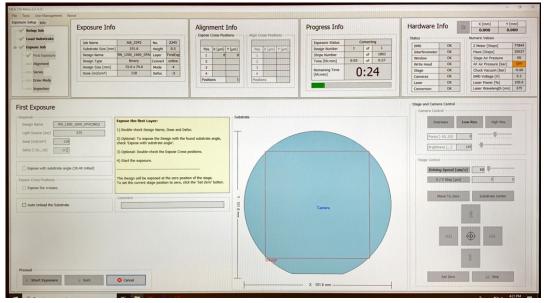


Figure 14. Heidelberg2 user interface setting information.

- b. Bake and develop the wafer using sygdev.
  - i. Developer program #9 (null) + Oven program #1 (Baking only).
  - ii. Developer program #3 + Oven program #1 (Developing + Baking).
- c. Check the wafer patterns using optical microscope and scanning electron microscope.
- 3. Remove HMDS layer using technics (descum)
  - a. Gas2: 37.5 sccm
  - b. Power: 50 W
  - c. Time: 2 min
- 4. The patterned wafer is then ready for metal deposition.