A quick tutorial on use of the Optolithium simulation tool

EE 669 VLSI Technology Course

Autumn-2022

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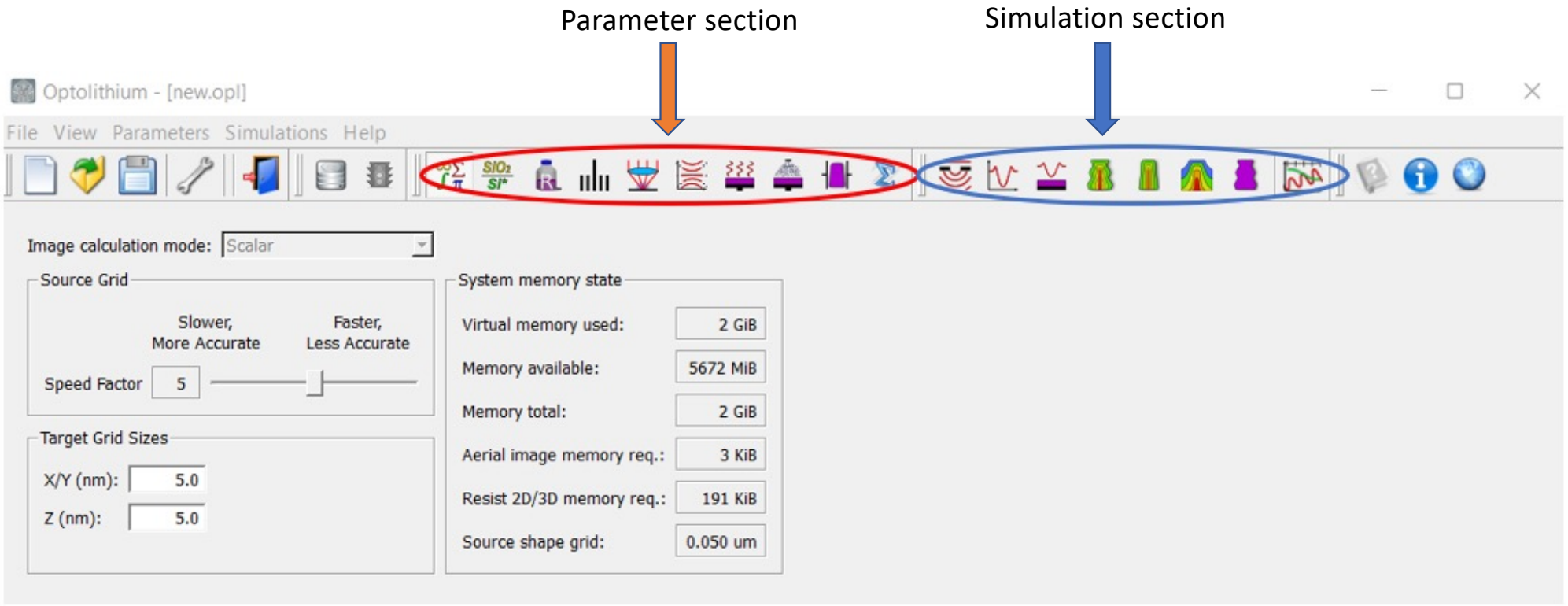
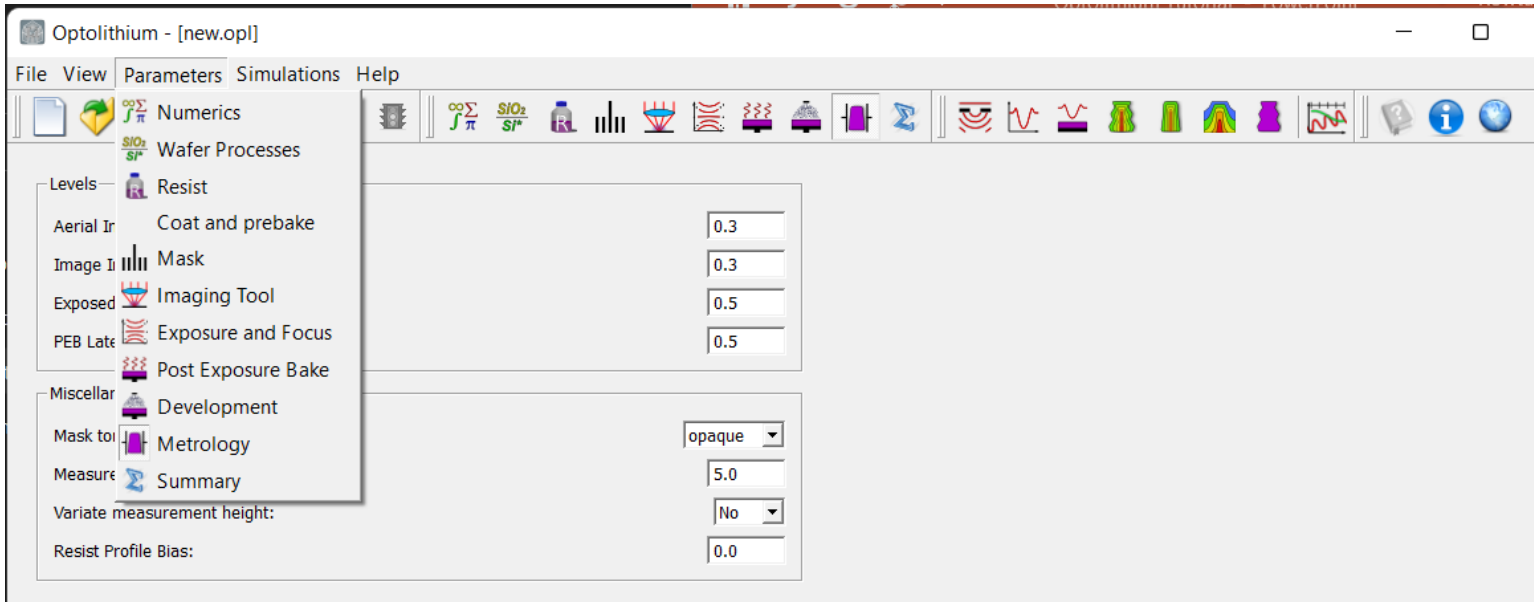
GUI Interface



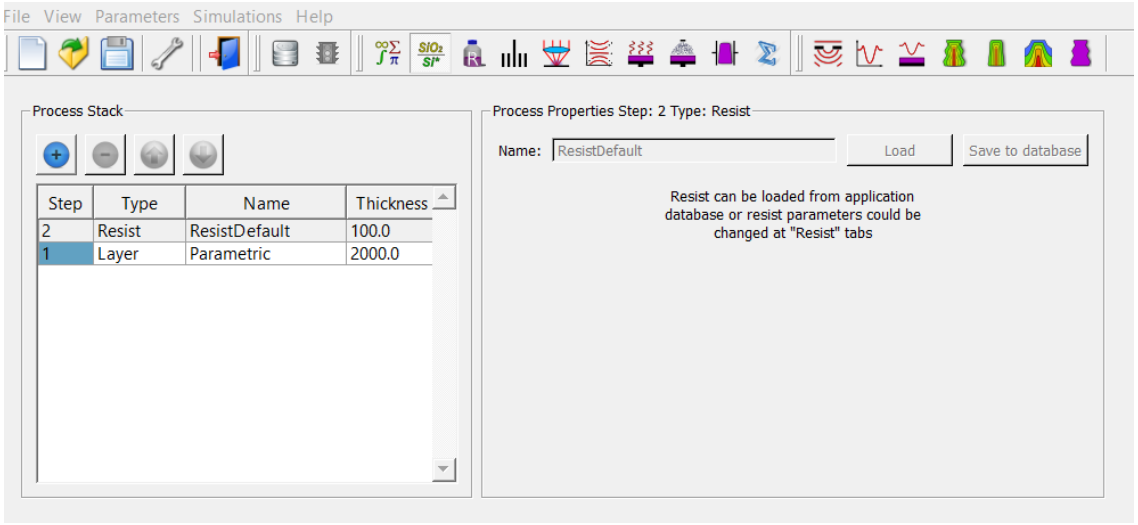
In Parameter section: We can define the process parameters from wafer stack, exposure tool parameters and post exposure parameters such as post exposure bake temperature, etc.

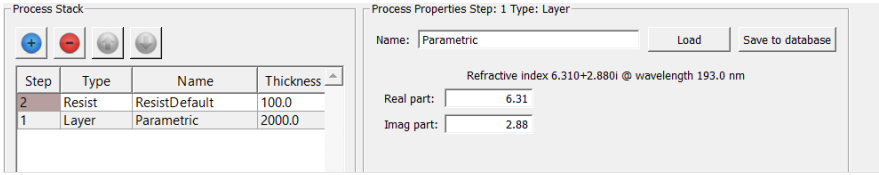
Parameter section



Explore to the GUI: From Process stack to development. In this section we will define all the parameters in this module

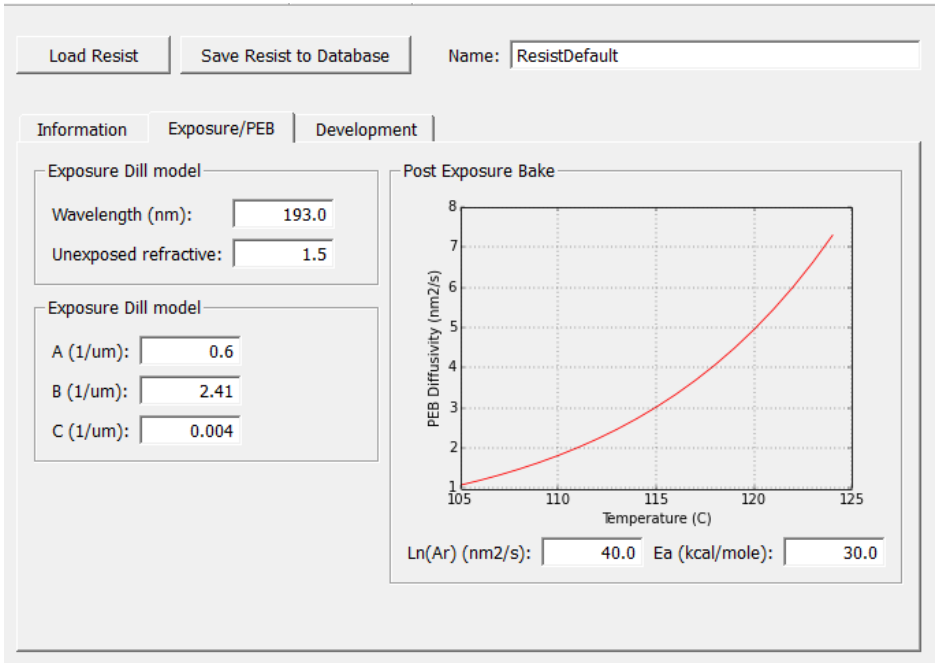
Wafer process section

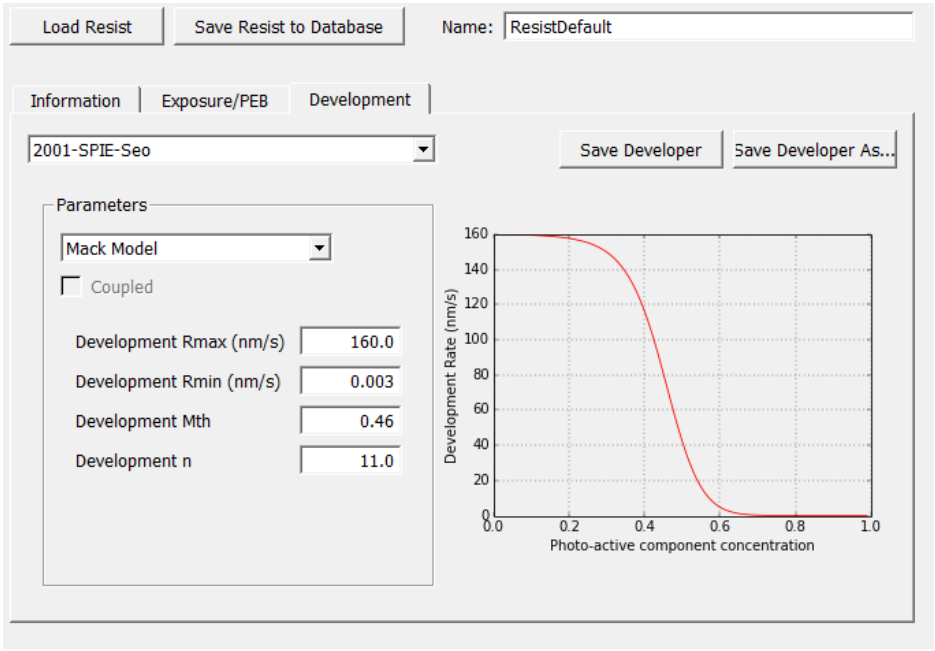




- Here we can define the substrate and top layers (Process stack)
- You can add and remove the layers by using radio knobs +,-
- Define the parameters such as Refractive index.

Resist Parameters





Exposure/PEB section

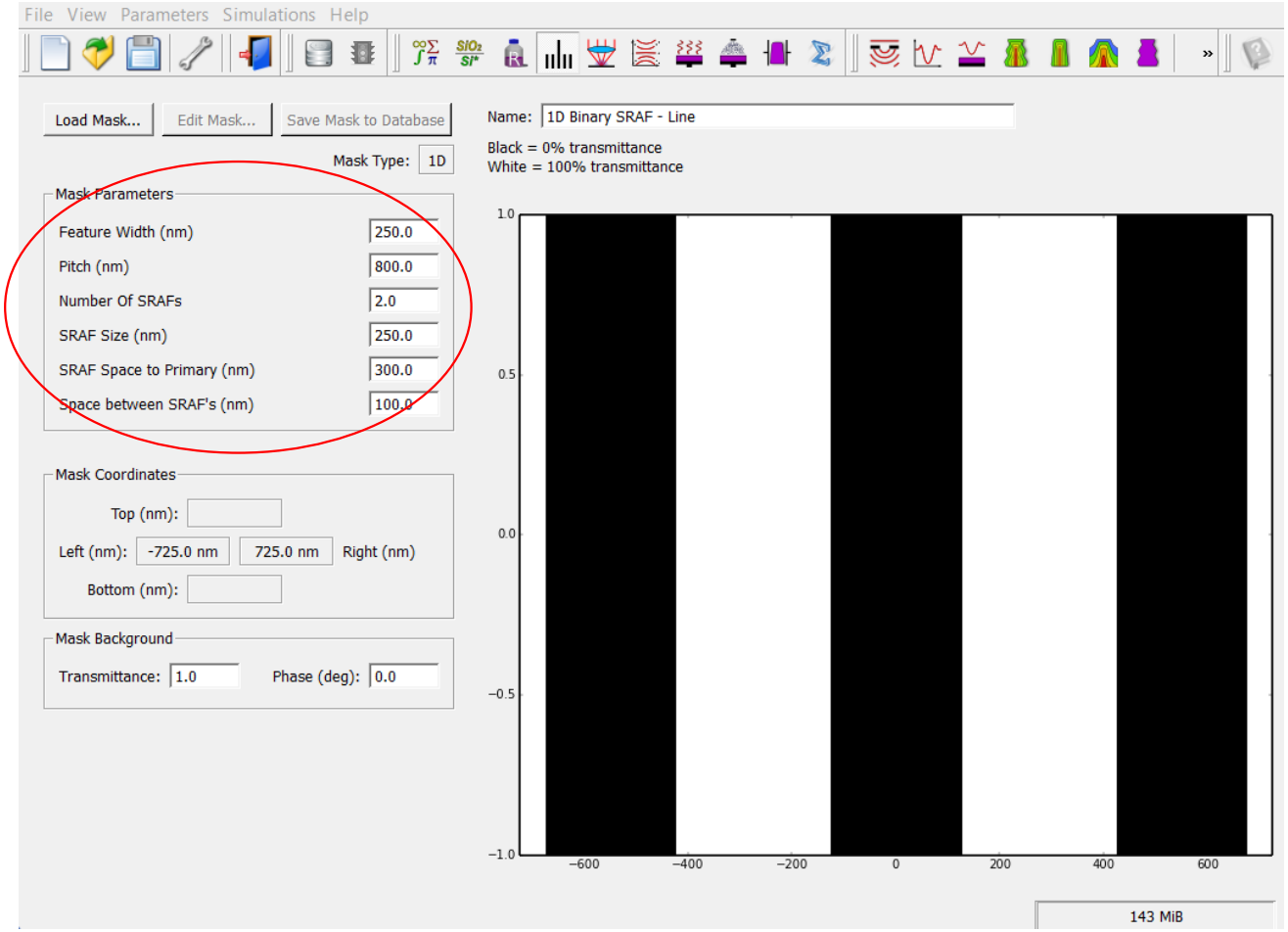
- A,B, C parameters of Dill model can be edited
- Wave length and RI
- Also the PEB diffusion model parameters can be edited.

Development section

- Different models are available. Choose Mack model in parameters
- Edit the Development rates max and min.

Mask Editing

- Load the Mask. 4 sets are available.
- Edit the Mask parameters according the requirement if needed.
  - Feature width
  - Pitch

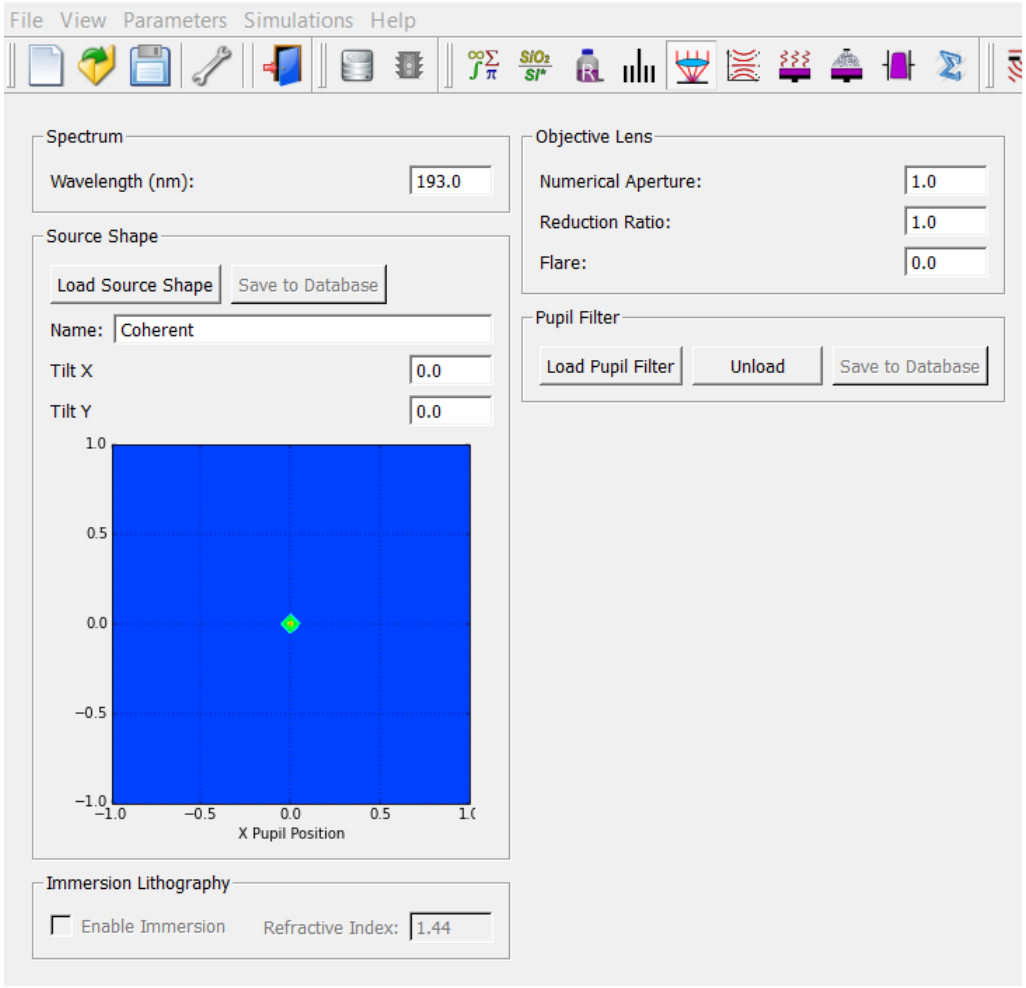


Imaging tool

- We can define wavelength
- Source shape: 3 type of source are available
  - Annular
  - Coherent
  - Convenient
- Objective lens:
  - Define NA, Reduction ratio here

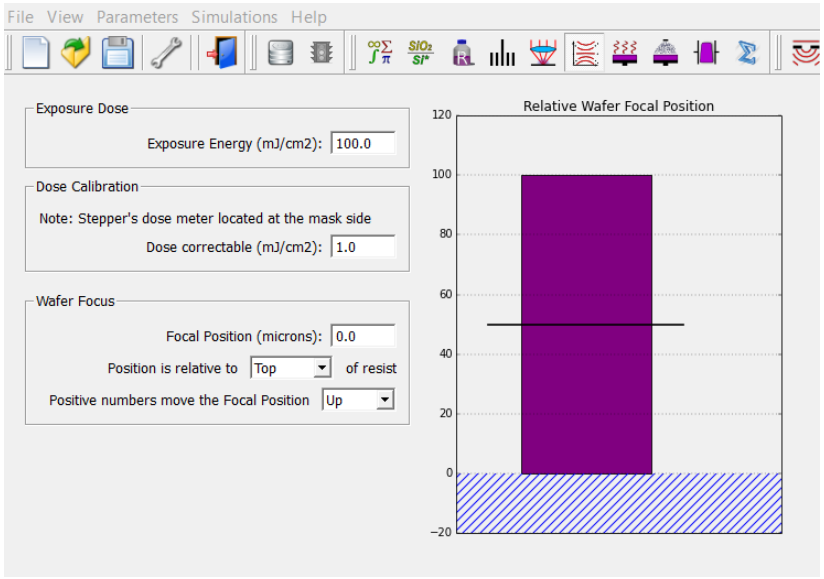
Other parameters (if needed)

- Pupil Filter ,Immersion



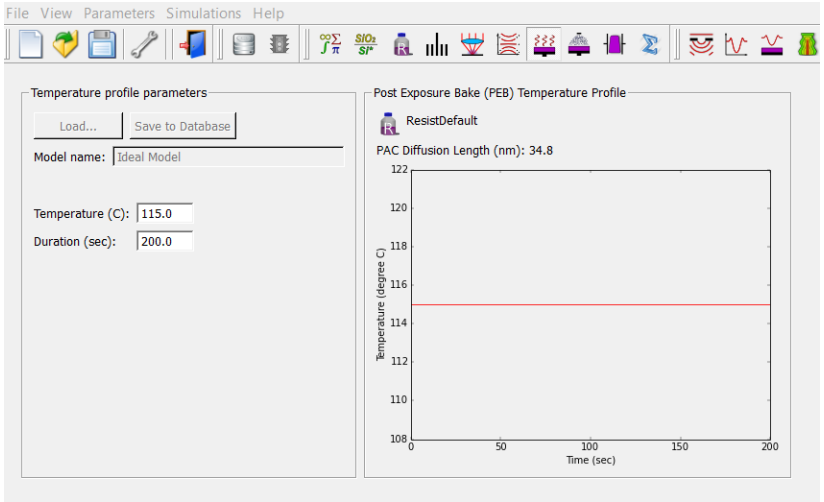
Exposure and Focus

- Set Exposure Energy
- Wafer focus usually at the top of resist.



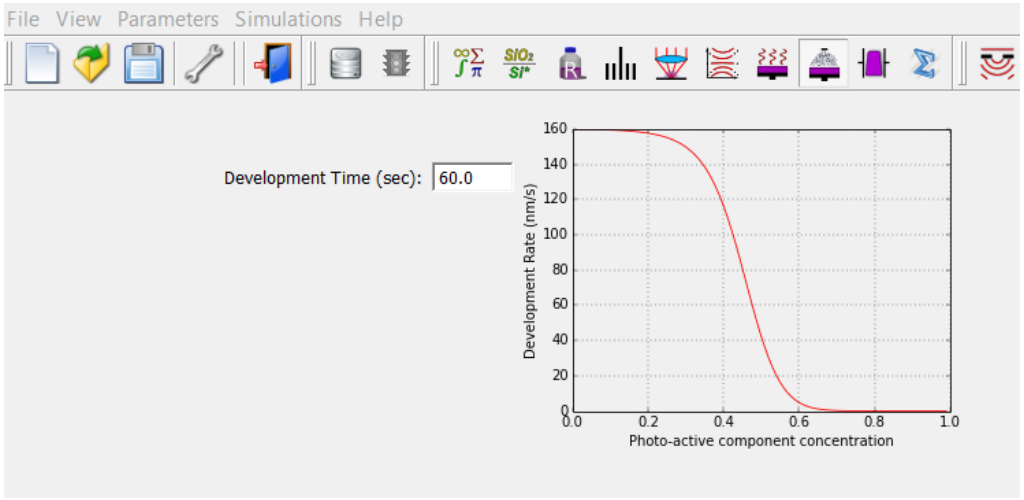
Post exposure and Bake

- Temperature and time are editable parameters are here.
- Changing these parameters PAC diffusion length varies.



Development

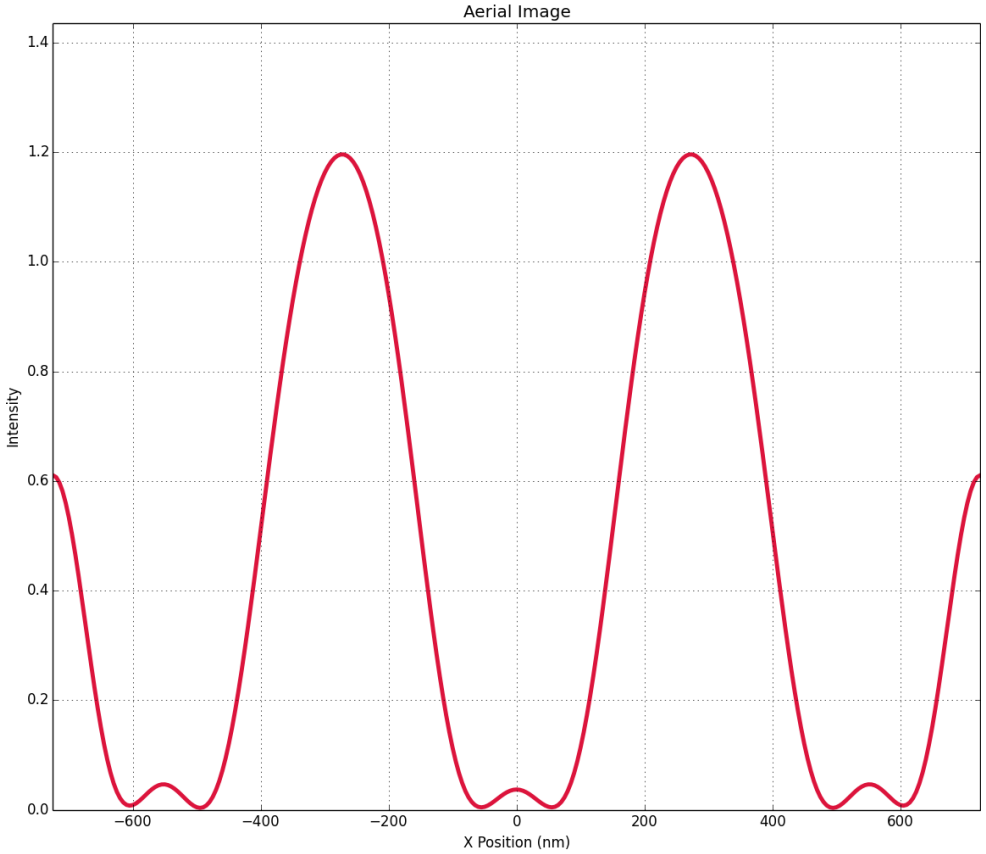
Define development time according to the graph shown right.



- Till here We define the Parameters for the Process stack , resist parameters, imaging and focus tool and post exposure parameters such as baking T and time finally development time.
- In summary we can see the defined parameters.

- Now move to simulation section

Simulation outputs



Areal image

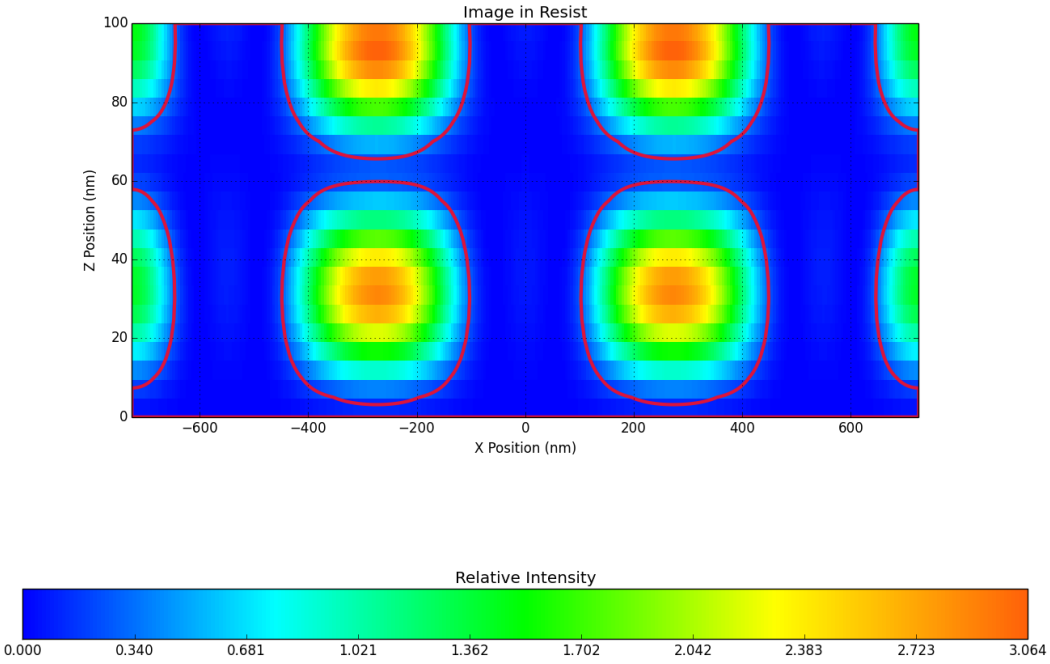
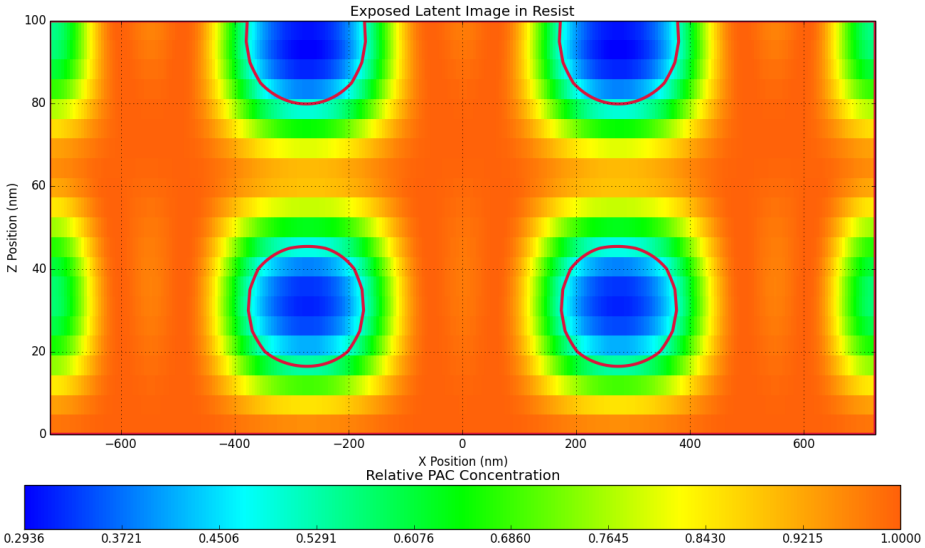
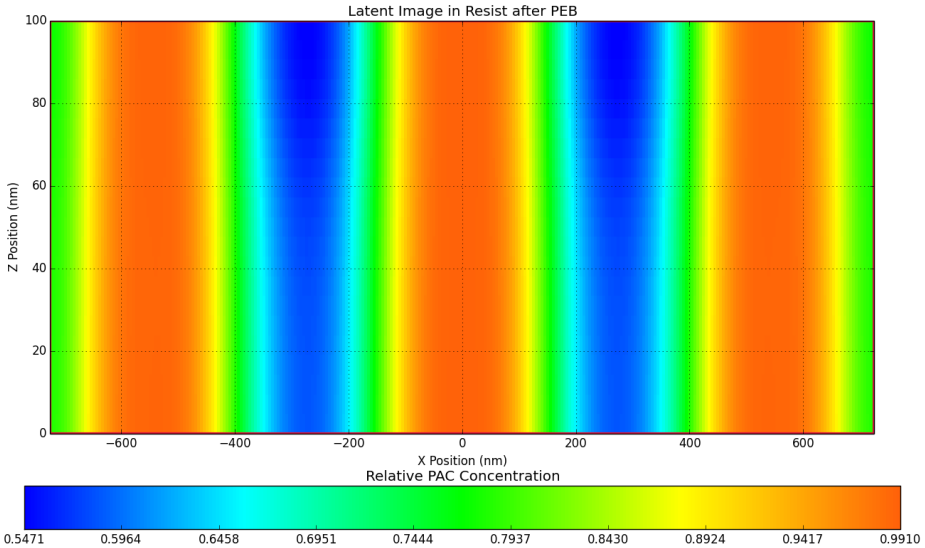


Image of intensity in the resist

Observation: in image “in resist “ the intensity varying in the mask opening area. This will effect the PAC in the resist. This can see in the exposed latent image

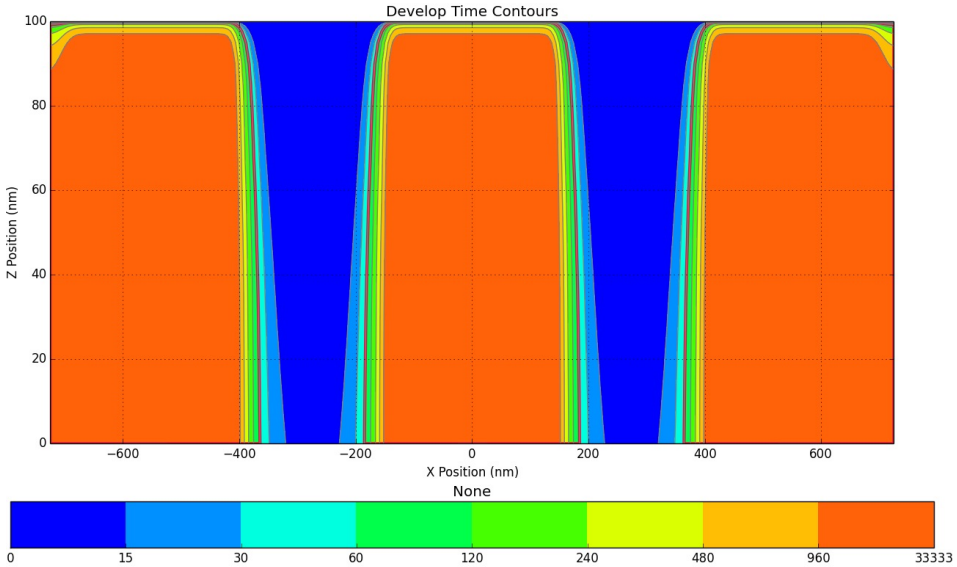
Simulation outputs : latent image before and After PEB



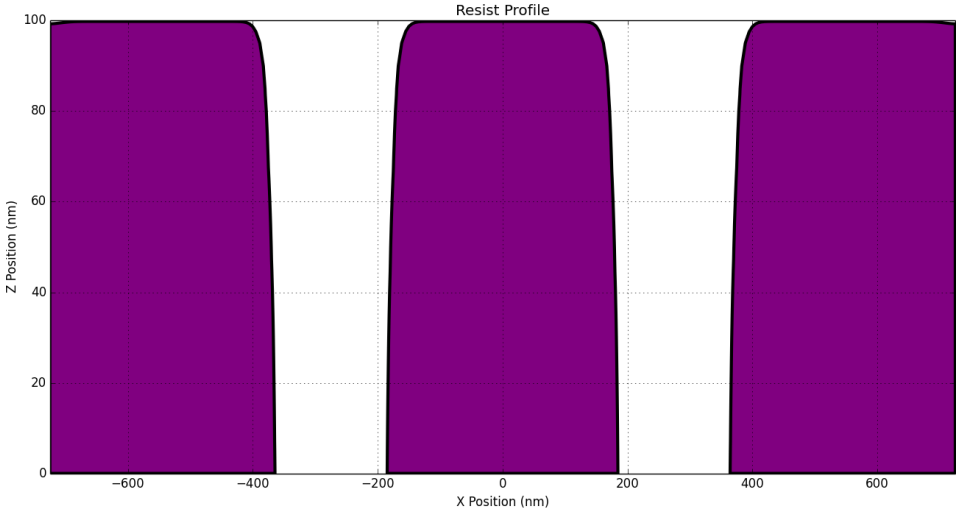


Observation: Due to the change in the light intensity in the resist the PAC concentration varies. This will effect the etch rate of the resist. To avoid this will do post bake exposure. Right side image well see that the PAC concentration is close to uniform in the mask opening regions.

Simulation outputs : Development time contours and resist profile



- Image represents the etched profile after development for different lengths. Contours can observe



- The final resist after development (60 s)

Thank You