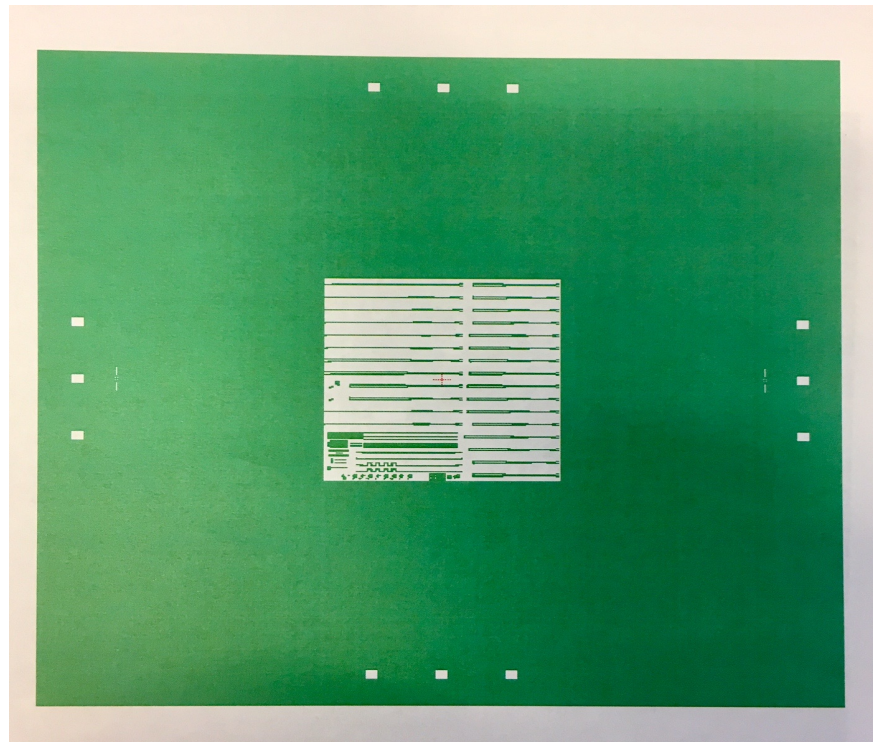


Mask Layouts

Single Layer Mask
(single field centered within the plate)



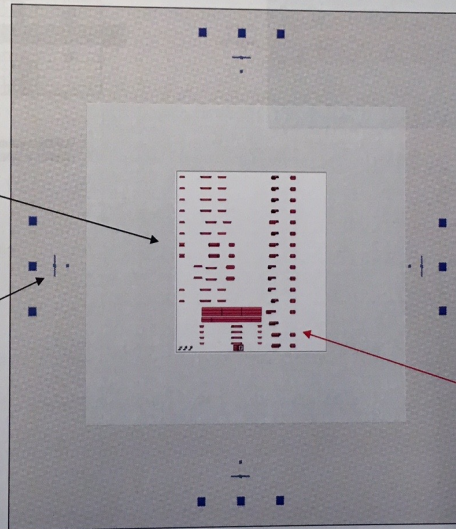
Mask Layouts

Single Layer Mask
(single field centered within the plate)

Mask Placement and Polarity

Field should be
centered in 5-inch plate

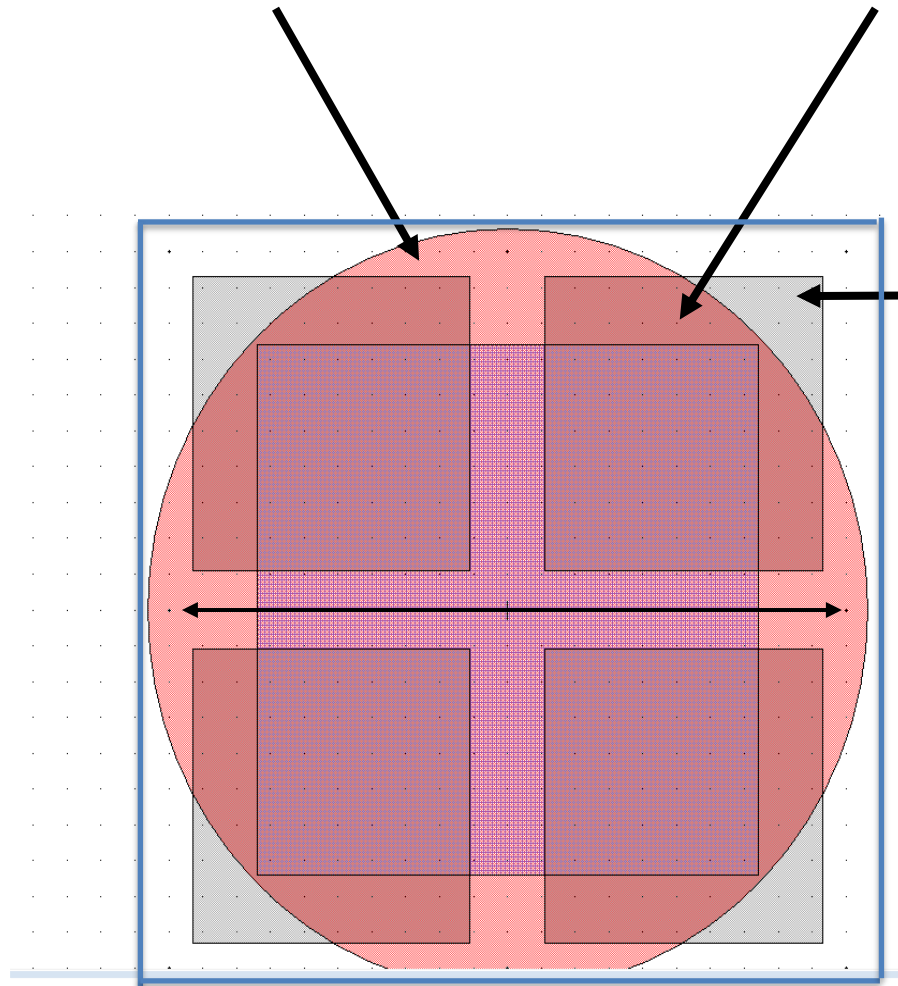
Stepper
fiducials



GDS Layer #1
Data is CHROME
Field is CLEAR

Exposure Field (red circle)
D=100mm

Large Square (blue box),
max die size (74x74) mm²

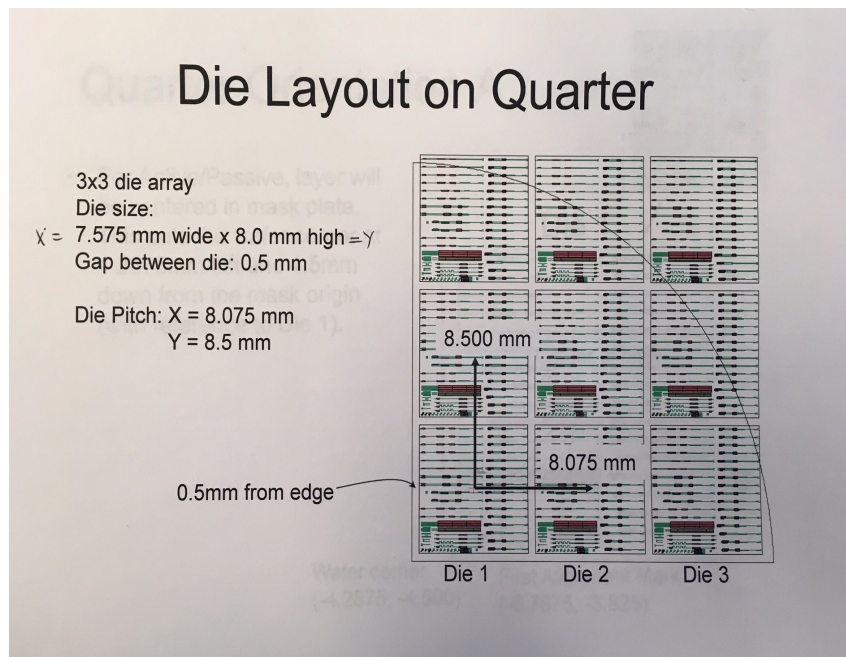


This part of your
mask will not be
properly exposed

The blue box in the middle is the largest single square size (die size $\sim(14.8 \times 14.8)$ mm²) that you can shoot on the wafer. This is because the "spot" size on the wafer is ~ 20 mm, mask scale is 5x (100mm). Anything outside the red circle is not going to be exposed properly. There will be some bleed through but the features will be under expose.

Mask plate (5x5)" $\sim (127 \times 127)$ mm²

Quarter with BL orientation writing the program TESTQ



- **AUTOSTEP200: LOG IN [10,1]**
- **CHUCK:142** (for $\frac{1}{4}$ of 2" pieces or smaller substrates then 2")
- **Diameter= 55mm** (if $\frac{1}{4}$ of 2 inch)
- **Cell size (die size):**
 $X=7.5750\text{mm}, Y=8.0000\text{mm}$
- **Gap between die=0.5mm**
- **Step size (step from die to die):**
 $X=8.0750\text{mm}, Y=8.5000\text{mm}$
- **Distance from DIE center to the lower left corner:**
 $X/2=3.7875\text{mm}$
 $Y/2=4.0000\text{mm}$
- Adding **1 mm from** the corner in X, and Y direction bring coordinates for x,y:
 $X=3.7875+1.0=4.7875\text{mm}$
 $Y=4.0000+1.0=5.0000\text{mm}$
- This is the pass shift for BL orientation:
PASS SHIFT: $x=+4.7875, y=-5.0000$

First layer (Layer#1 or your first lithography)

Running the job: EX TESTQ, pass: 1

BL: Left objective (R3, C1), Right objective (R3, C3),

Press “A” on the key board, the stage moves, and left objective should be positioned above R3C1

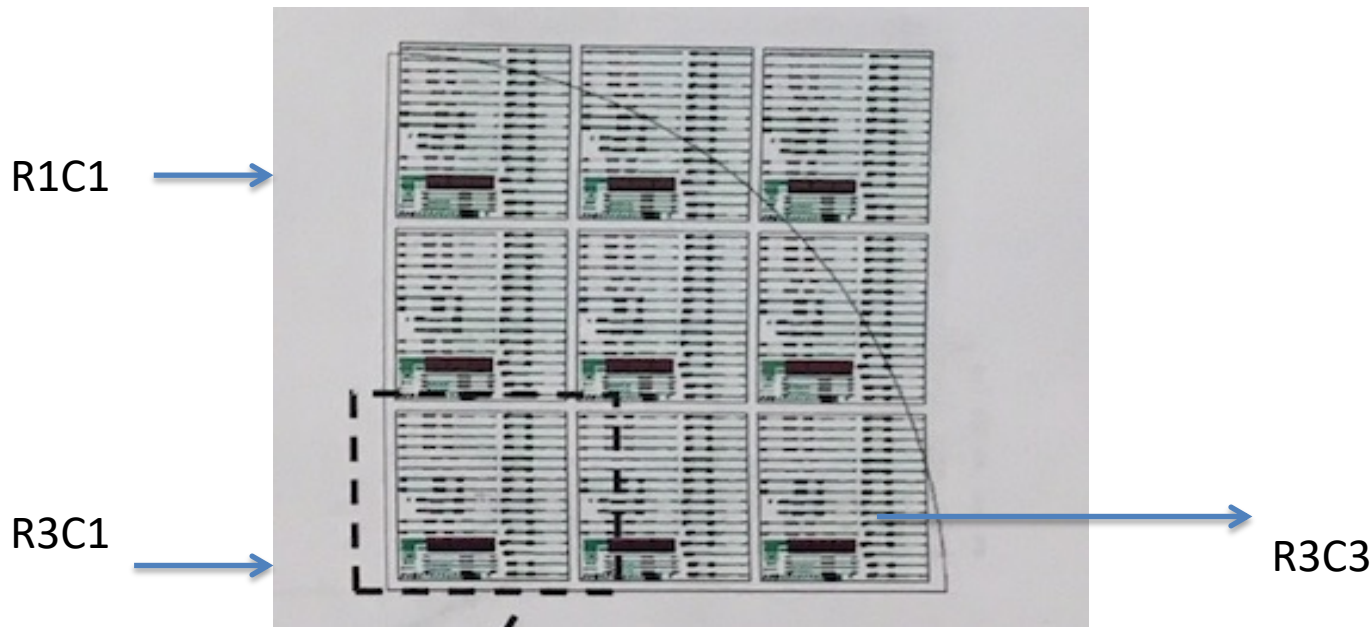
Find the lower left corner of your substrate

Press “D”(to switch movement from die to die)

Aligning takes time (align well along x- axis, and y-axis)!

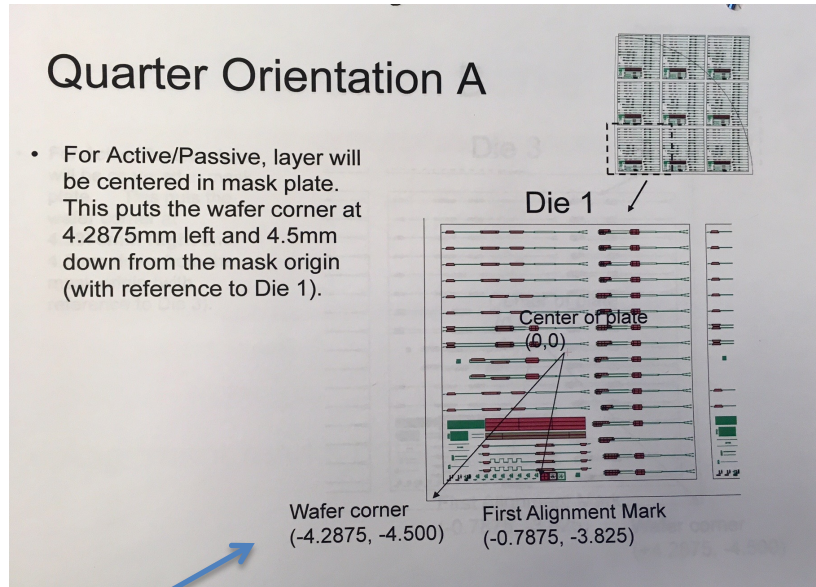
The left objective should be positioned above R3C1 prior exposing

Key offset is : $x=0$, $y=0$; PASS SHIFT: $x=+4.7875$, $y=-5.0000$



How to expose first layer (aligning to the LL(lower left)corner of sample)

Orientation A - BL



If 0.5mm is added along the edges (x,y). In my calculation I added 1mm along the edges!

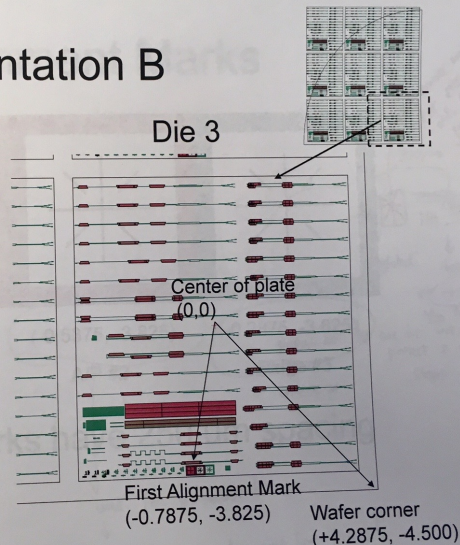
How to align

- Find the proper chuck, load the sample on the chuck, use screws to help in positioning the sample always at the same place (turn ON the vacuum)
- Load chuck on the stage (turn ON the vacuum)
- Press "A" on the keyboard to move the stage, so LEFT objective is above die R3C1
- Find the BL corner
- Press button "D" on the key board, and press on arrow → to step from die to die. Be careful, step as many times as the number of dies you have in that direction (if you have 3 columns, you can step 3X) . Be slow and meticulous. Stay on the sample.
- If you step out of sample you might receive the message " Q" for quit. Press "red" button inside of the chamber and start all over with the aligning
- Once aligning is complete (always use right window on monitor for aligning), go back to die R3C1, so LEFT objective is above die R3C1, press expose
- Watch the numbers on voltmeter (column height). This should be in range of -10V to 10V. Ideal focus would be around 0V.

Quarter with BR orientation writing the program TESTQ

Quarter Orientation B

- For Active/Passive, layer will be centered in mask plate. This puts the wafer corner at **4.2875mm Right** and 4.5mm down from the mask origin (with reference to Die 3).



- AUTOSTEP200: LOG IN [10,1]
- CHUCK:142 (for ¼ of 2" pieces) or smaller than 2")
- Diameter= 55mm (if 1/4 of 2 inch)
- Cell size (die size):**
 $X=7.5750\text{mm}$, $Y=8.0000\text{mm}$
- Gap between die=0.5mm
- Step size (step from die to die):**
 $X=8.0750\text{mm}$, $Y=8.5000\text{mm}$
- Distance from DIE center to the lower left corner:
 $X/2=3.7875\text{mm}$
 $Y/2=4.0000\text{mm}$
- Adding **1 mm from** the corner in X, and Y direction bring coordinates for x,y:
 $X=3.7875+1.0=4.7875\text{mm}$
 $Y=4.0000+1.0=5.0000\text{mm}$
- This is the pass shift for BL orientation:
PASS SHIFT: $x=-4.7875$, $y=-5.0000$

First layer (Layer#1 or your first lithography)

Running the job: EX TESTQ, pass: 2

BR orientation: L objective (R3,C1), R objective (R3,C3)

Do Not use "A" for this orientation!

Find the lower right corner

Press "D" (to switch movement from die to die)

Aligning takes time (align well along x- axis, and y-axis)!

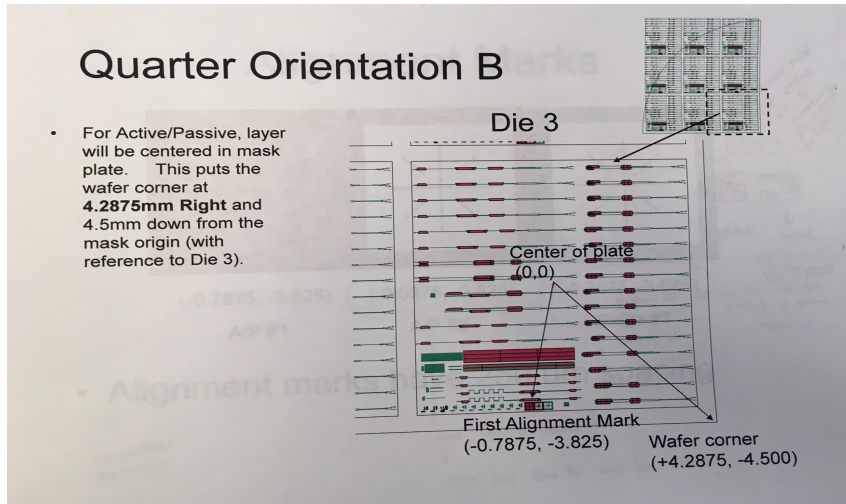
The right objective should be positioned above R3C3 prior exposing

Key offset is : $x=0$, $y=0$; PASS SHIFT: $x=-4.7875$, $y=-5.0000$

A micrograph showing a 3x3 grid of dies. The dies are arranged in three rows and three columns. The top-left die is labeled R1C1 with a blue arrow pointing to it. The bottom-left die is labeled R3C1 with a blue arrow pointing to it. The bottom-right die is labeled R3C3 with a blue arrow pointing to it. A dashed line indicates the alignment path from the top-left die to the bottom-right die. The dies are mounted on a substrate, and the alignment markers are visible on the dies.

How to expose first layer (aligning to the LR(lower right)corner of sample))

Orientation B - BR



If 0.5mm is added along the edges (x,y). In my calculation I added 1mm along the edges!

How to align

- Find the proper chuck, load the sample on the chuck, use screws to help in positioning the sample always at the same place (turn ON the vacuum)
- Load chuck on the stage (turn ON the vacuum)
- Find the BR corner
- Press button "D" on the key board, and press on arrow → to step from die to die. Be careful, step as many times as the number of dies you have in that direction. Be slow and meticulous. Stay on the sample.
- If you step out of the sample you might receive the message "Q" and option to quit. Press "red" button inside of the chamber (lower, left side) and you have to start all over with aligning
- Once aligning is complete (always use right window on monitor for aligning), make sure your RIGHT objective is above die R3C3, press expose
- Watch the numbers on voltmeter (column height). This should be in range of -10V to 10V. Ideal focus would be around 0V.