Welcome to KLA's

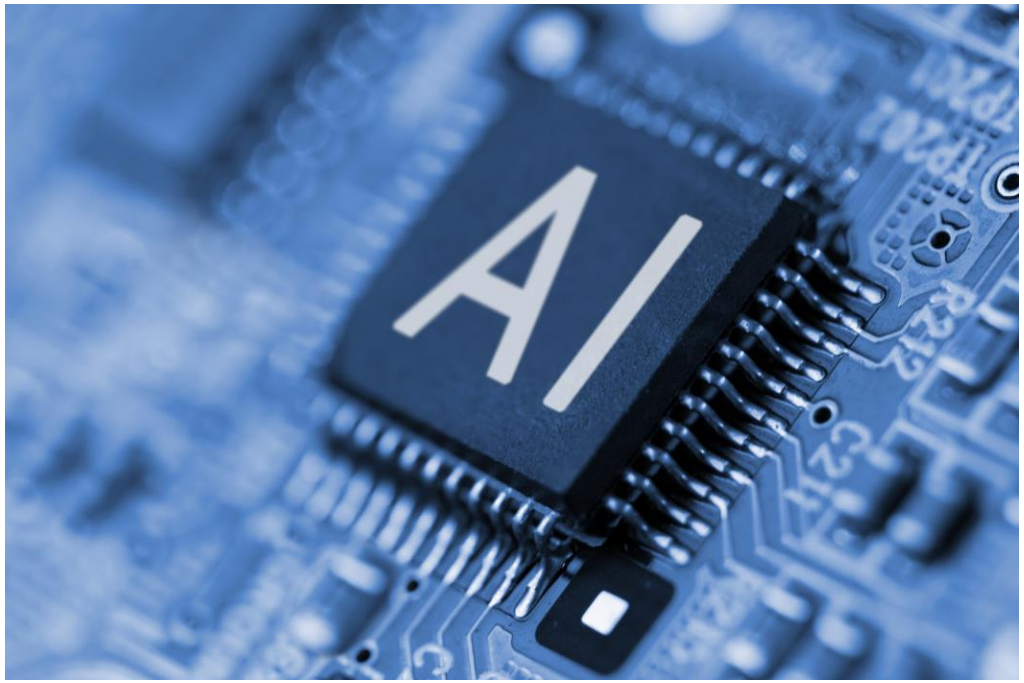
Software Engineering Workshop

Jan 12, 2024

Agenda for the day

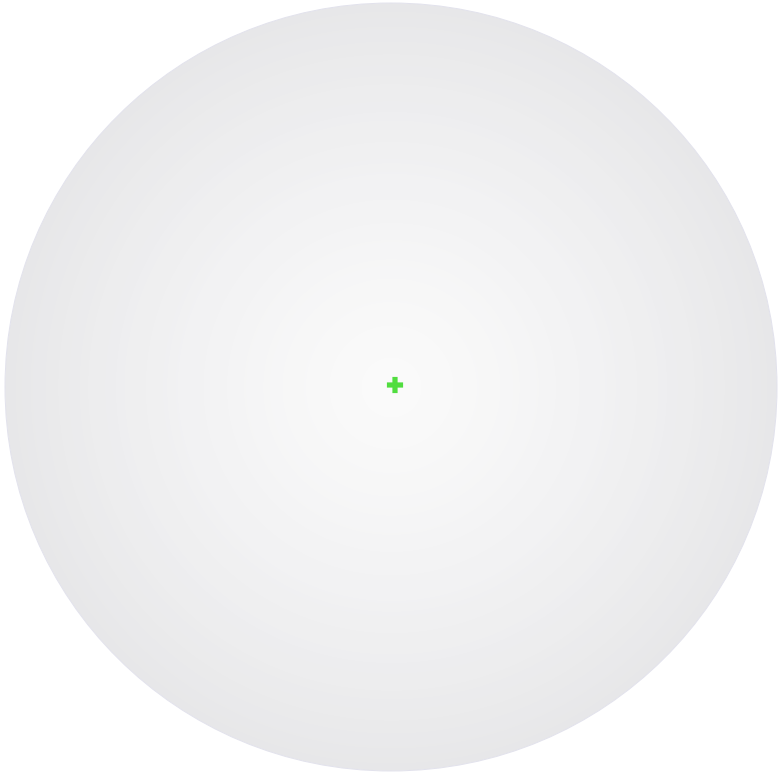
8:15am	Problem statement description
8:45am	Students download input dataset & problem description
9:00am	Q&A Students start investigating & solving the problem
9:30am onwards	Mentor assigned to you will check-in and connect
	Mentors will check-in with you hourly and guide
1:00pm	Lunch
5:00pm	Final cut off to submit results and final mentor check-ins
6:15pm	Results announcement

Silicon Chip



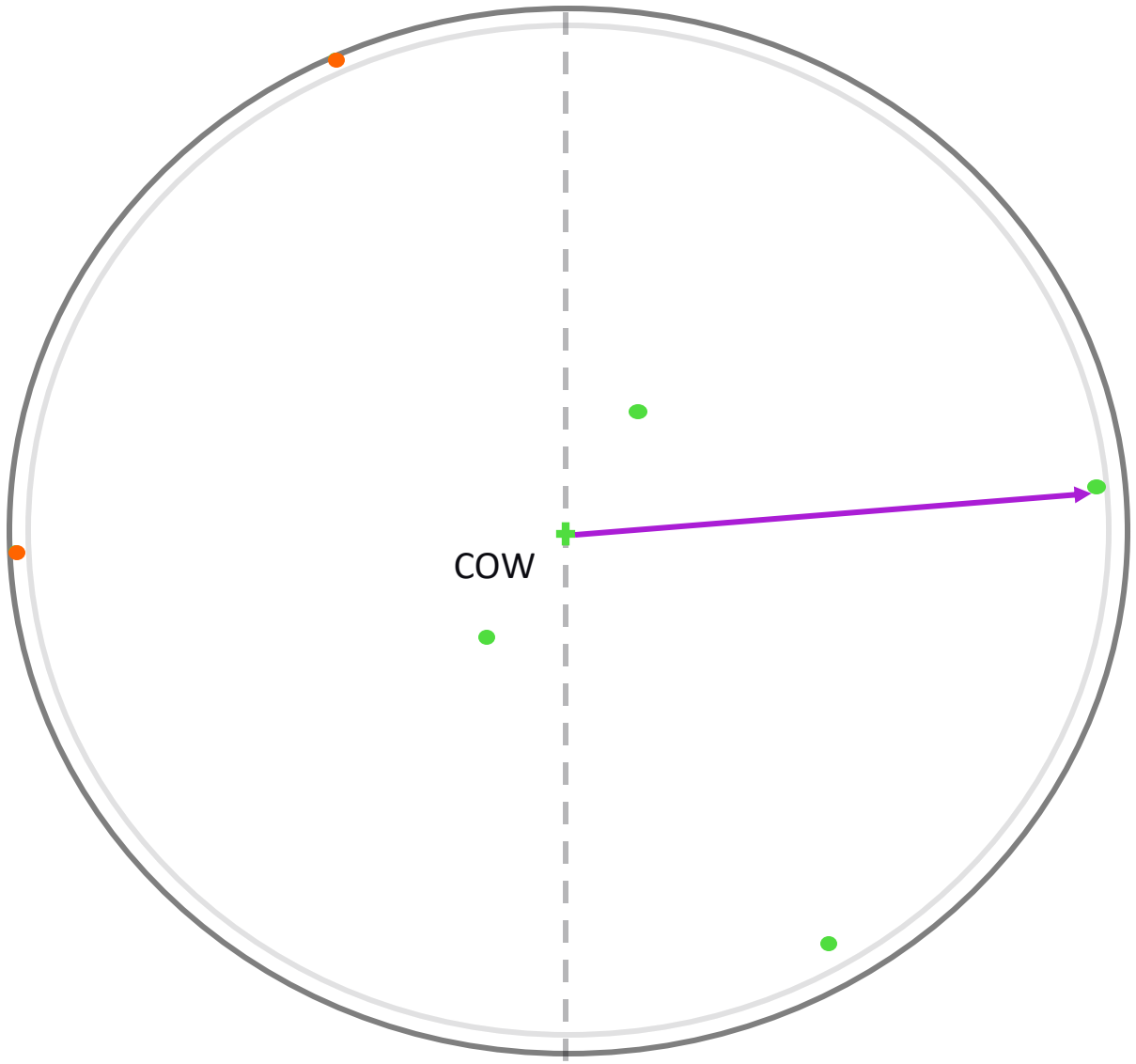
Wafer manufacturing process

Silicon Ingot



Bare wafer

Bare wafer



Center of wafer

Wafer Size (mm)

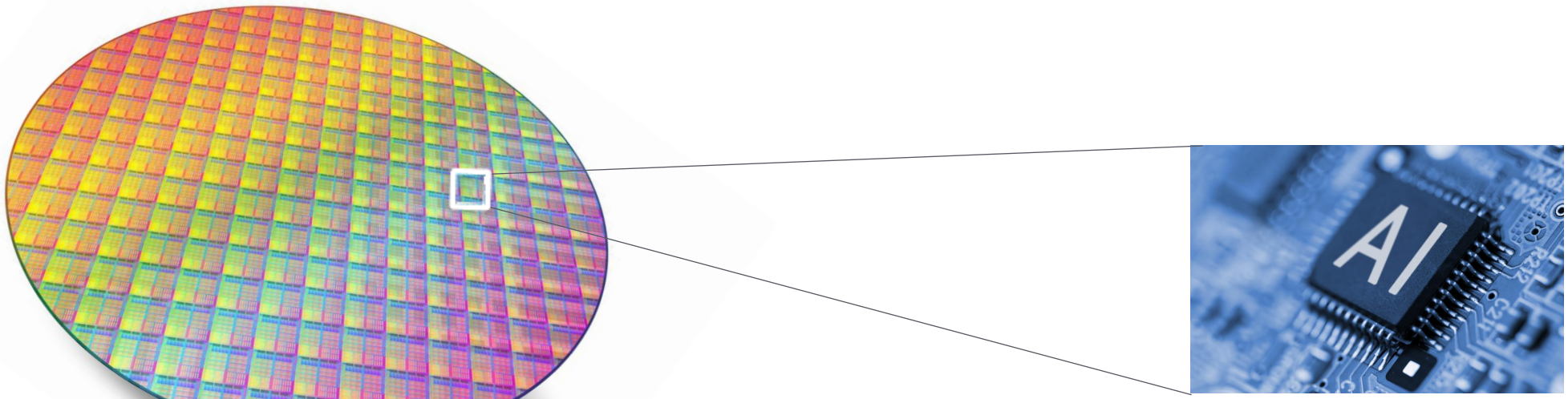
Measurement Location in wafer coordinate

Distance from COW -> Measurement location

Edge exclusion boundary

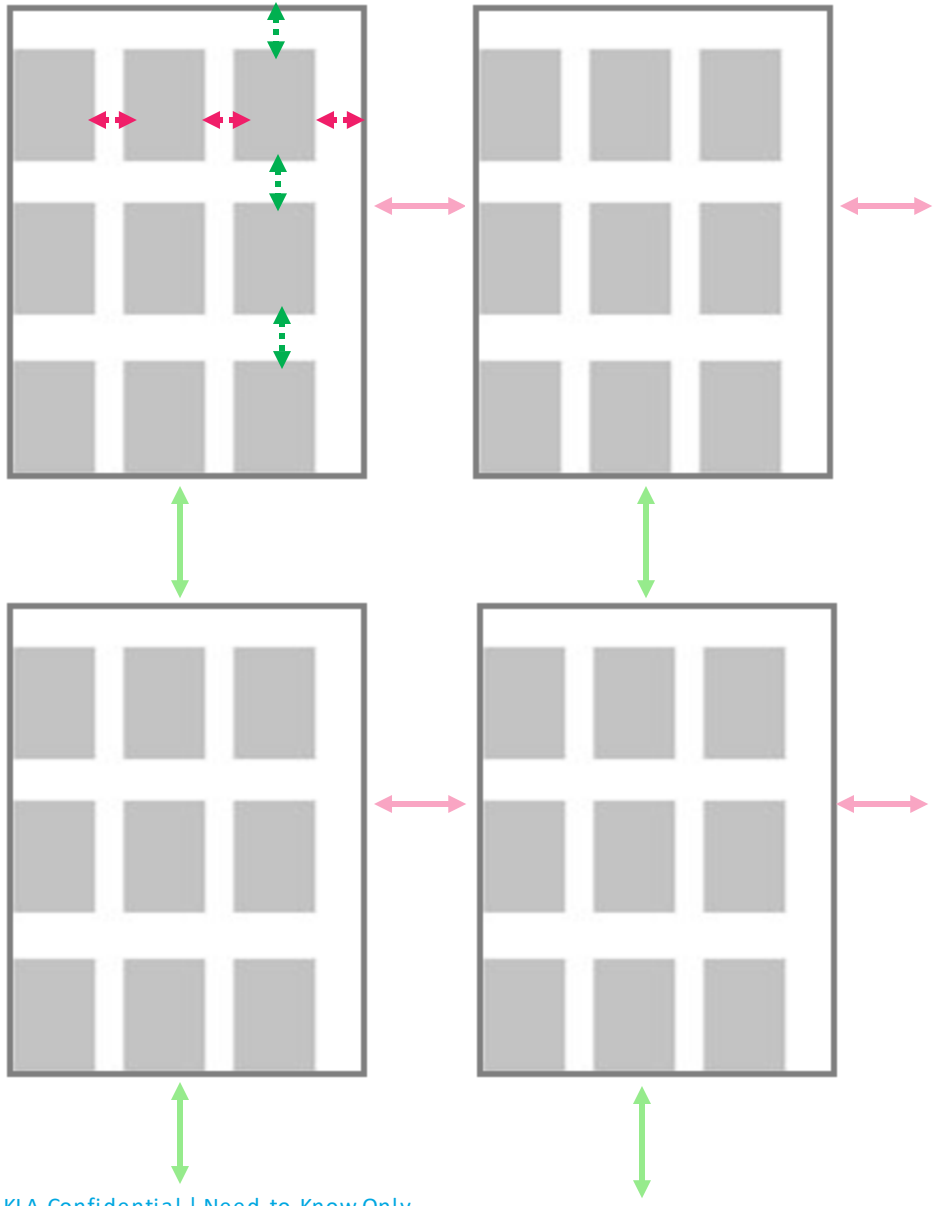
Excluded Measurement locations

Patterned wafer



Patterned wafer

Reticle, Die & street

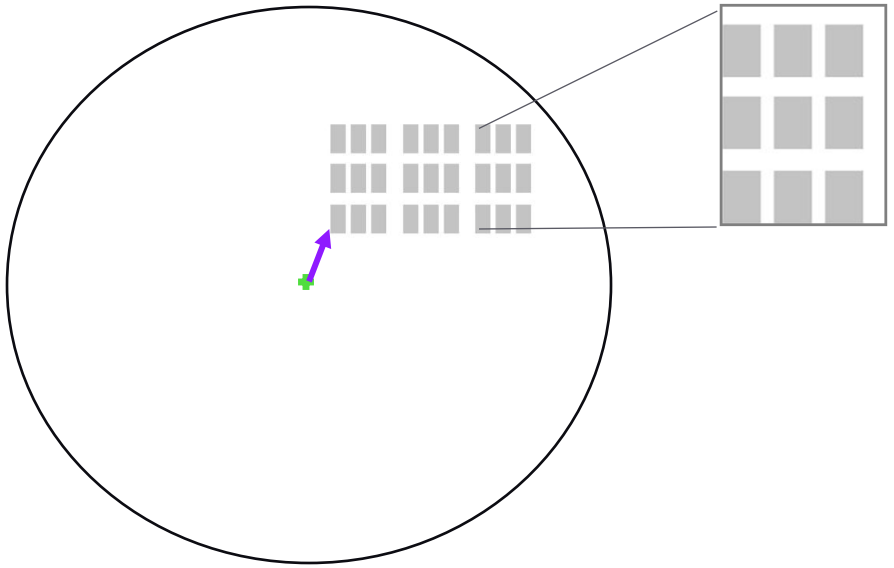


Die street width

Die street height

Reticle street width

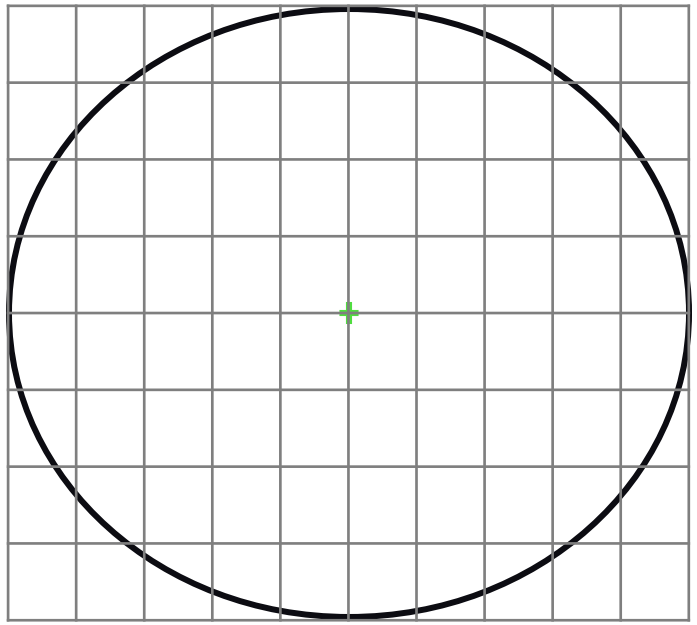
Reticle street height



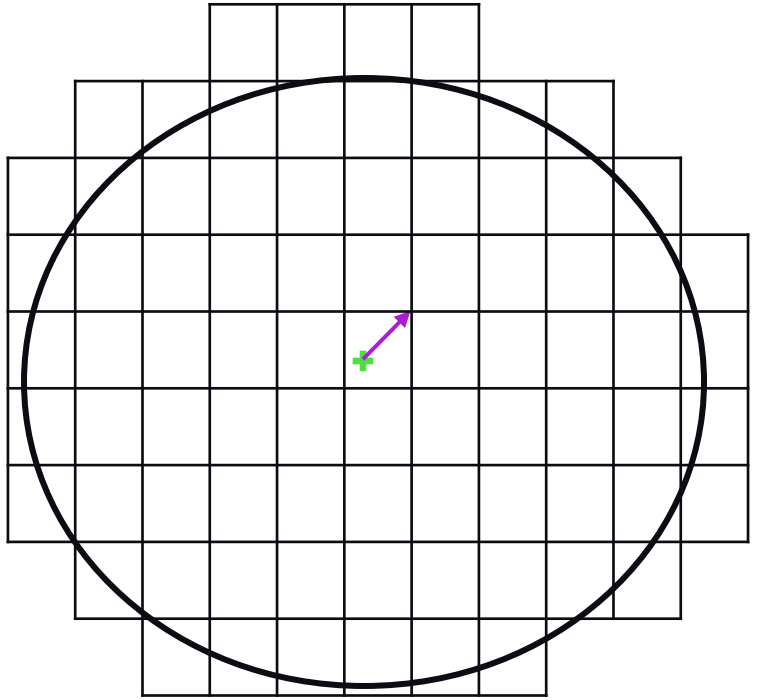
Die shift (Reticle with 1x1 die)

COW

Die Shift vector (COW to Lower left die in Reticle)

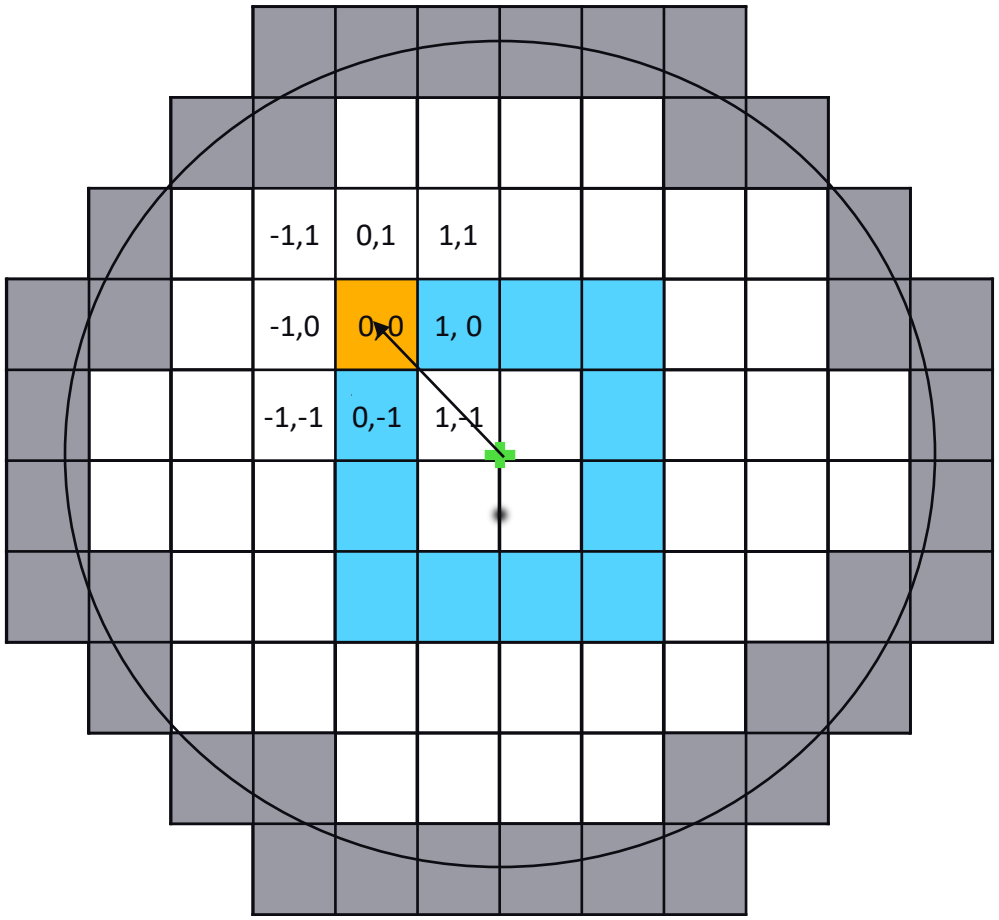


Die Shift vector from COW = 0



Die Shift vector from COW = (+,+)

Die Index, Reference die, Partial and Measurement die



COW

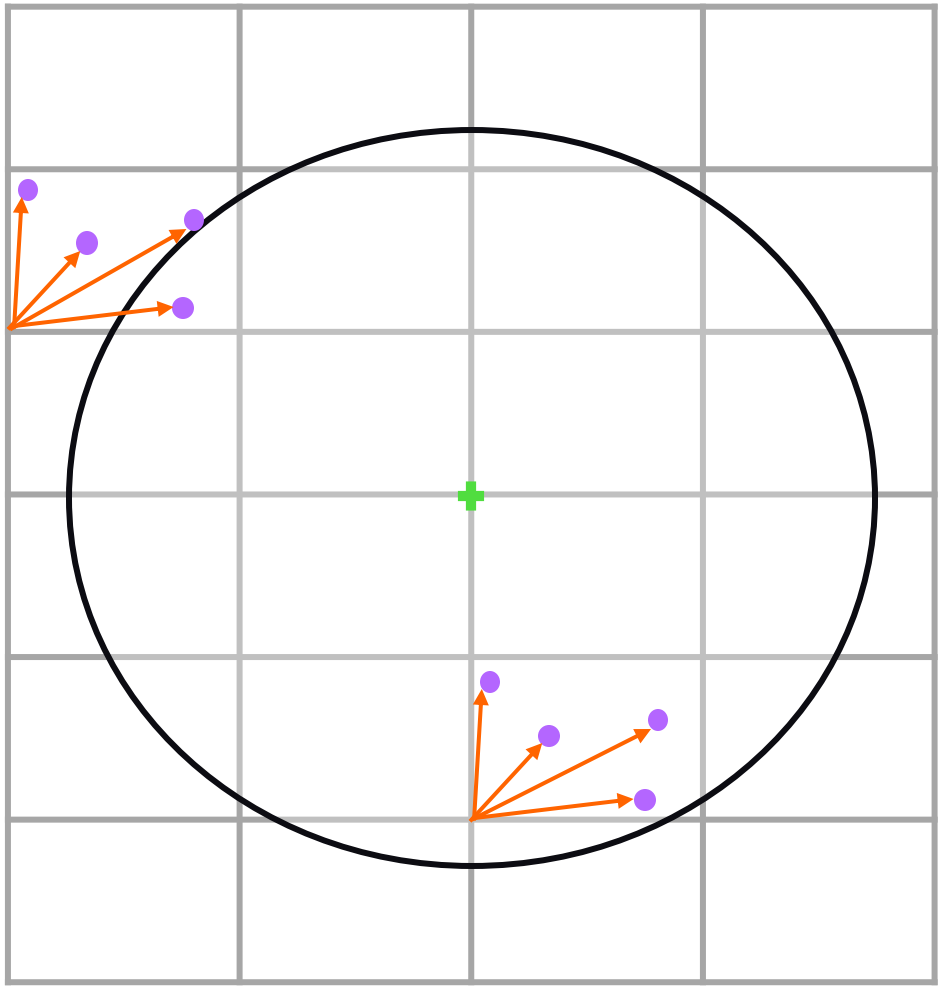
User's reference die

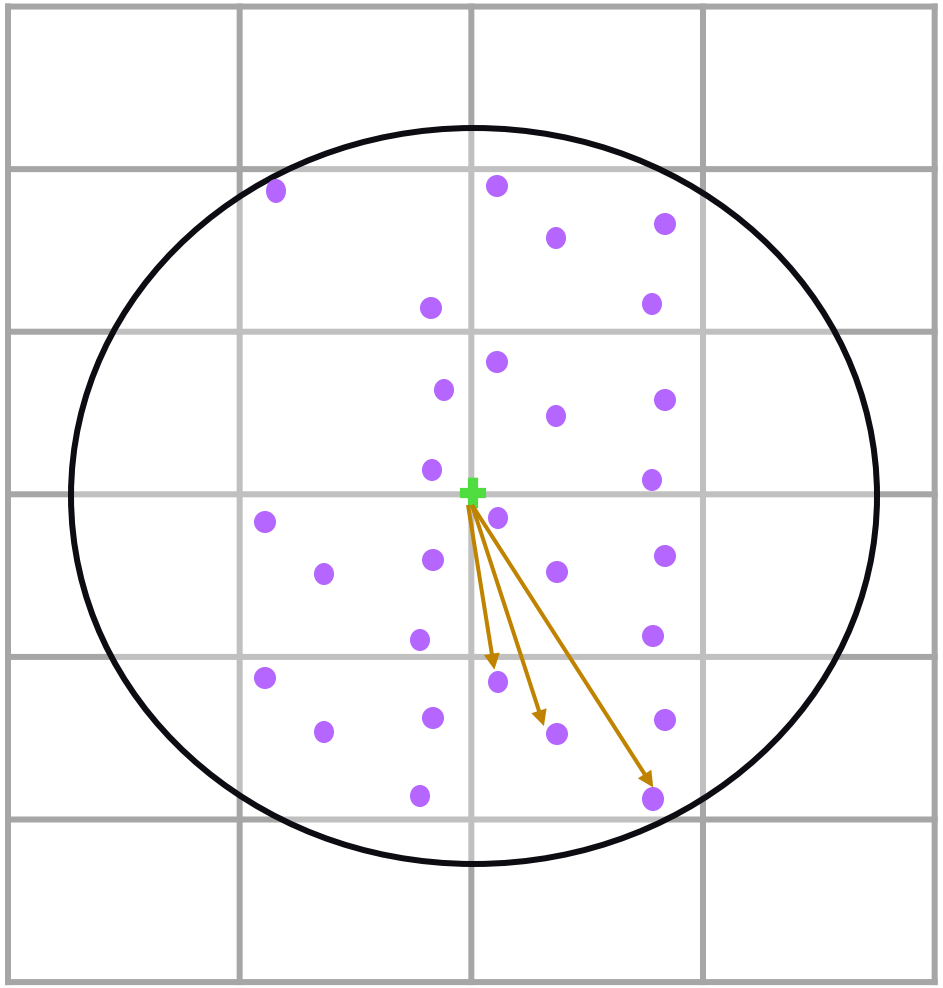
COW to Center of Reference die

Partial die

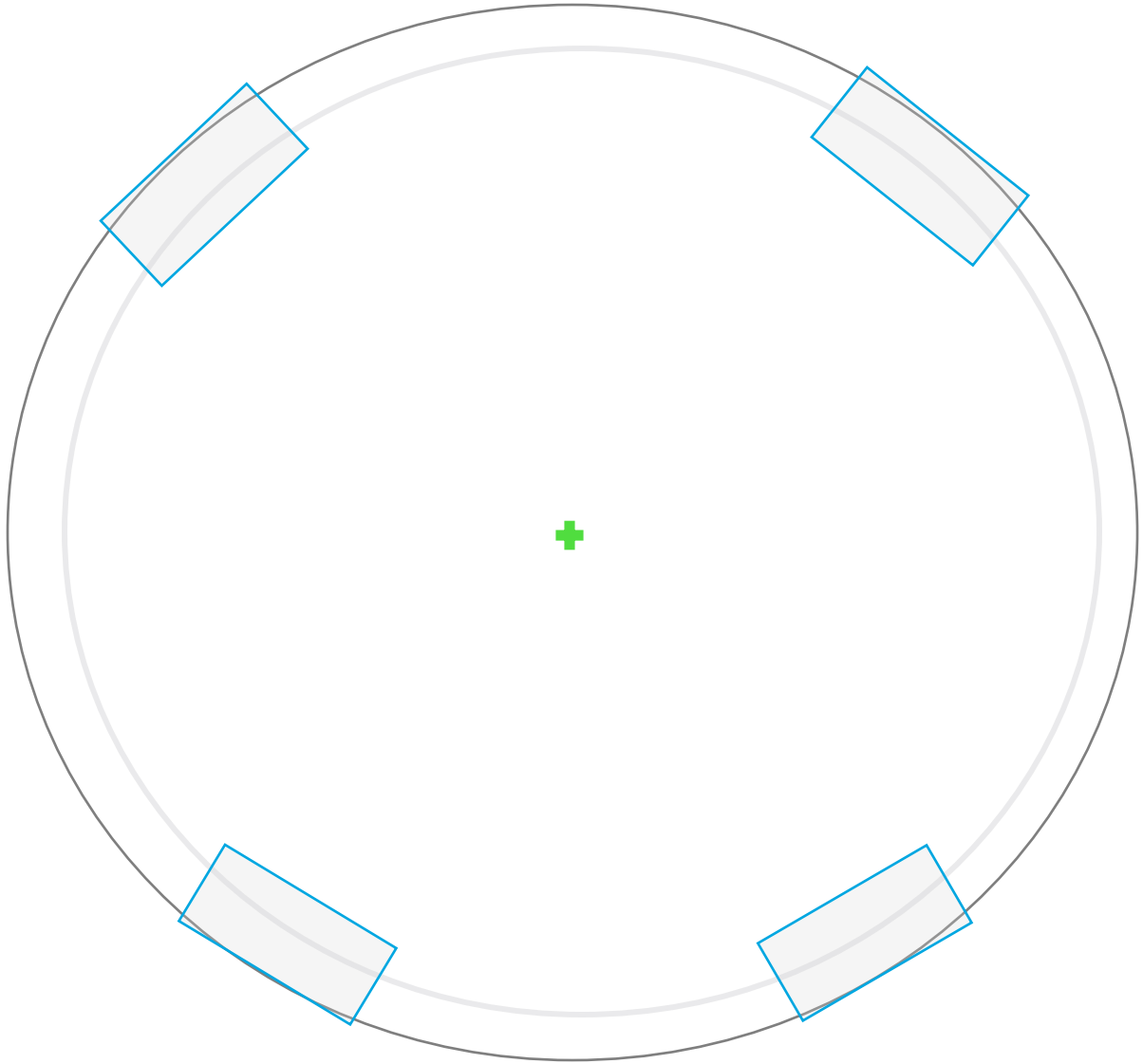
Measurement die

Die coordinate vs Wafer coordinate

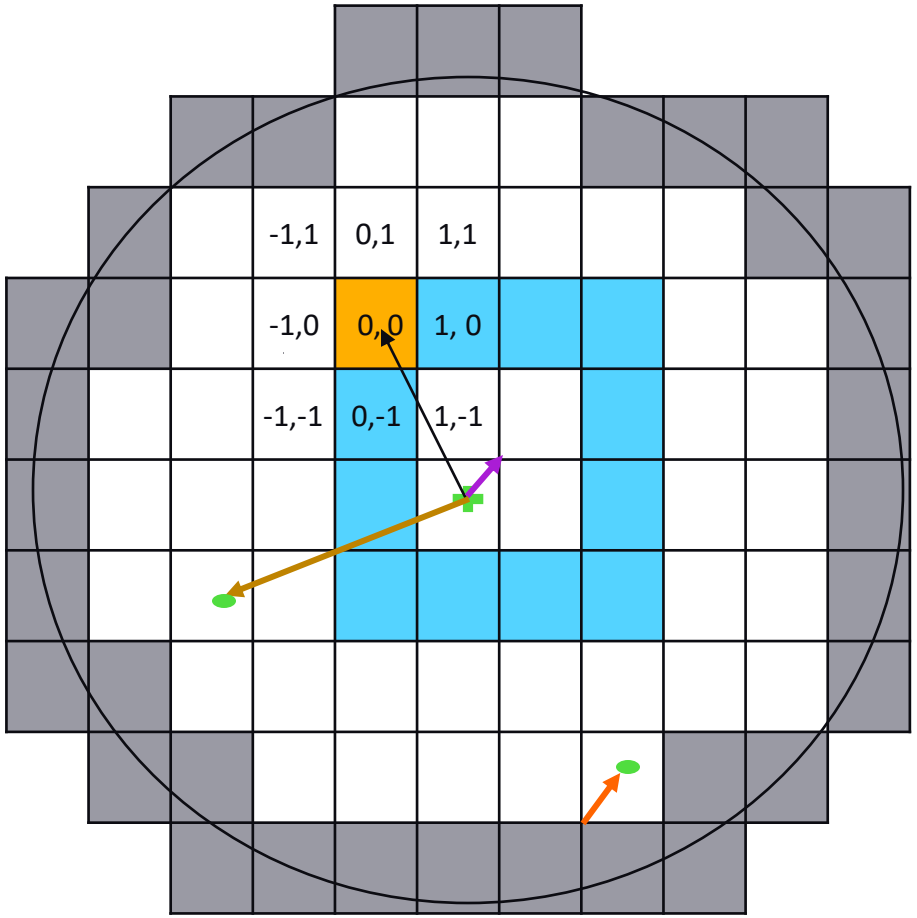




Wafer Gripper



Summary



Wafer map with Reticle of 1 x 1 Dies

Cow

User's reference die

Cow to Center of Reference die

Partial die

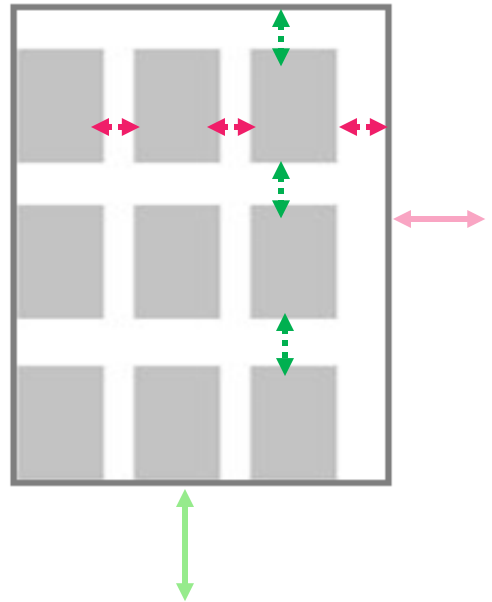
Measurement die

Die Shift vector

Measurement Location

Distance from COW to measurement location

Distance from Die LLC



Reticle with 3x3 Dies

Milestone 1 – Bare wafer map

Input

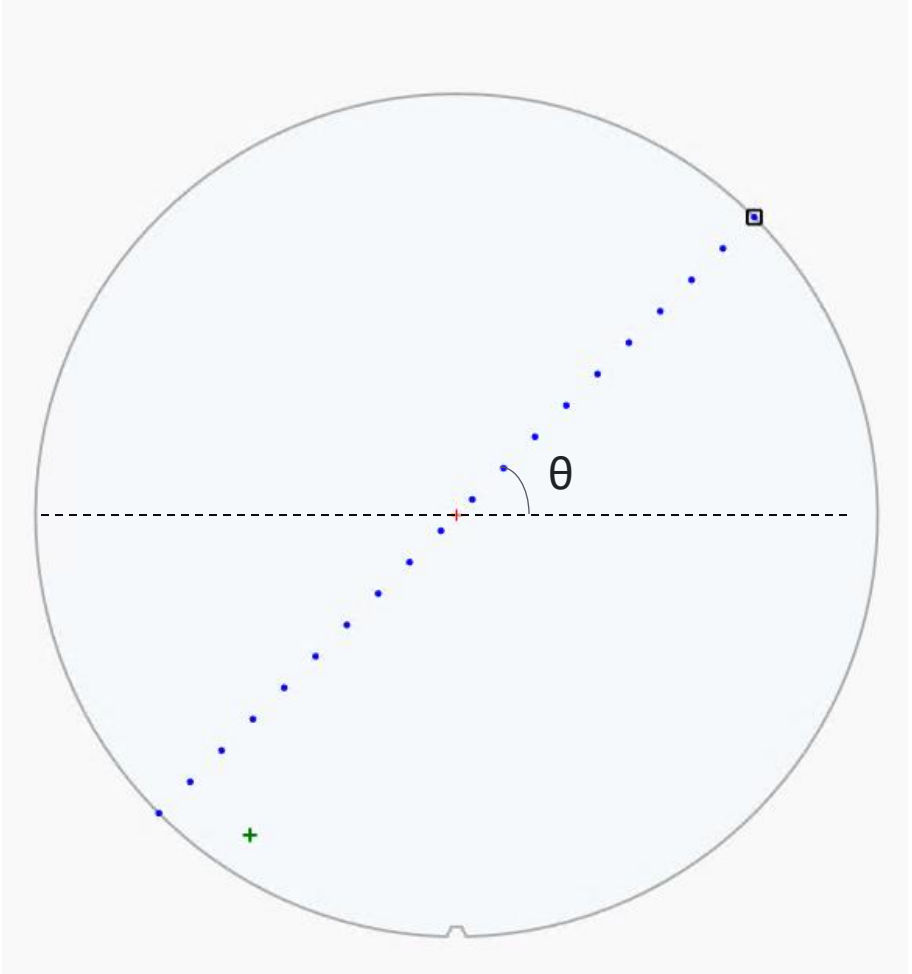
- Wafer Diameter (mm)
- N - number of equally spaced points to be generated
- Angle in (deg)

Output

- Generate N points that are equally spaced at a given angle.

Output Format (in mm)

```
(-120.0000, 0.0000)
(-119.6552, 4.5000)
(-149.3103, 2.0000)
(-181.9655, 0.0000)
(-124.6207, 0.0000)
(- 98.2759, 0.0000)
```



Milestone 2 – Simple Pattern wafer map

Input

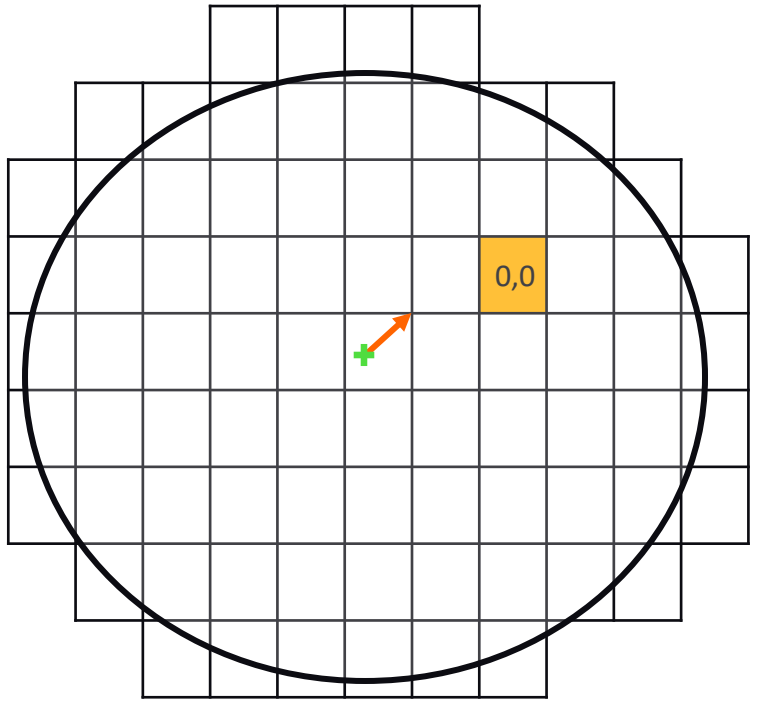
- Wafer Diameter (mm)
- Die size x, y (mm),
- Die shift vector x, y (mm)
- Distance from COW to Center of Reference Die x, y (mm)

Output

- Die Index of all dies including partial dies from reference die
- LLC of all valid dies (including partial dies) in wafer coordinate

Output Format (in mm)

```
(0,0):(15.1231, 20.3200)

(2,3):(30.4534, 40.1223)
```

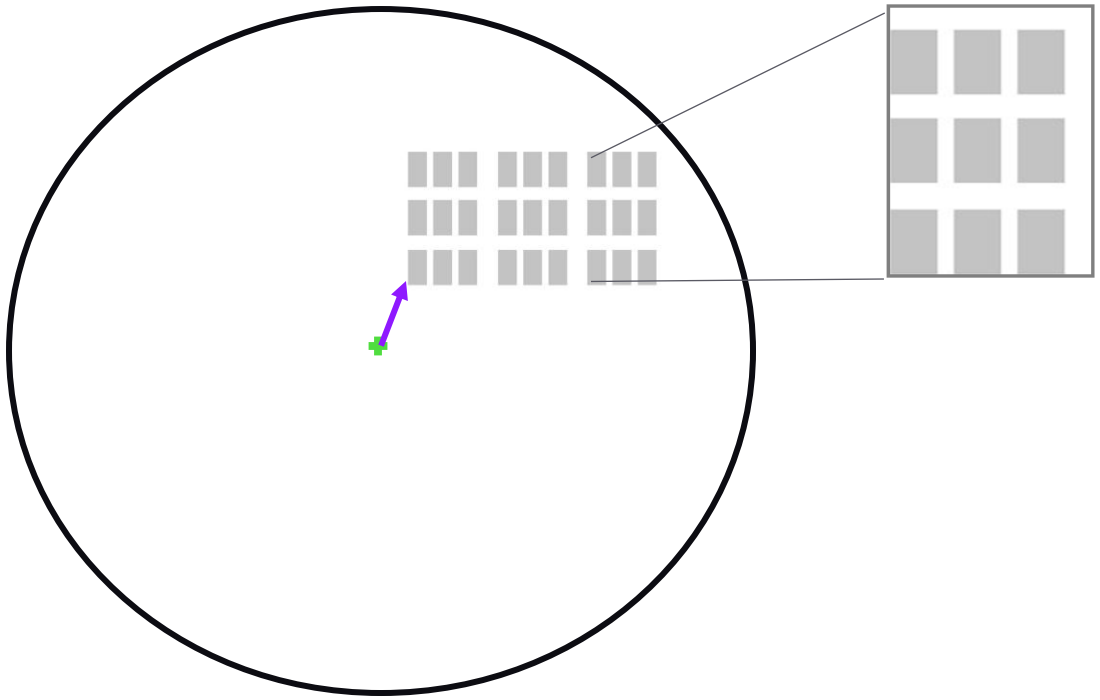


Die Shift vector from COW = (+,+)

Milestone 3 – Asymmetric wafer map

Input

- Wafer Diameter (mm)
- Die size x, y (mm)
- Die shift vector x, y (mm)
- Distance from COW to Center of Reference Die x, y (mm)
- **Number of dies per reticle (rows x columns)**
- **Reticle Street Width & Height (mm)**
- **Die Street Width & Height (mm)**



Output

- Die Index of all dies including partial dies from reference die
- LLC of all dies including partial dies in wafer coordinate

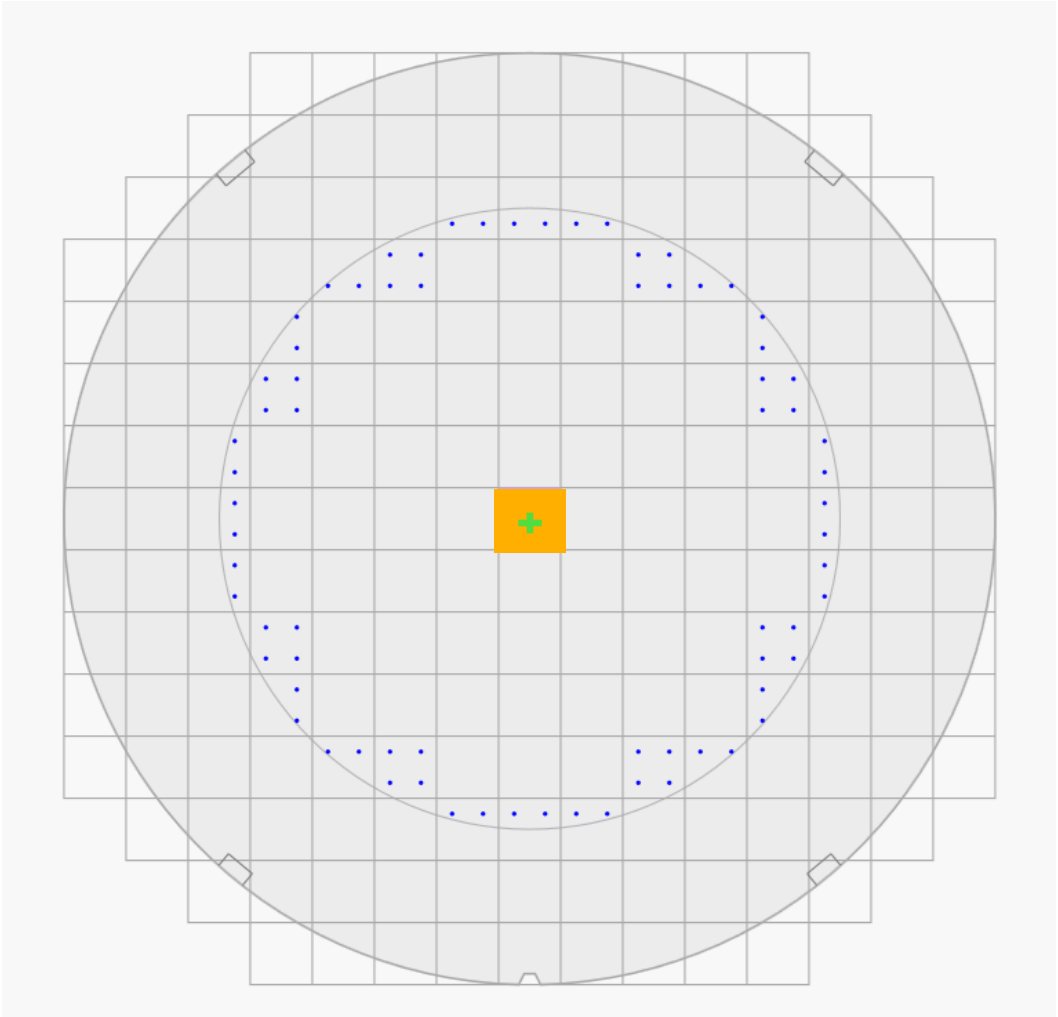
Output Format (in mm)

```
(0,0):(15.1232, 20.3212)

(2,3):(30.4512, 40.1232)
```

Milestone 4 – find measurement locations in dies on a given radius

Input

- Wafer Diameter (mm)
- Die size x, y (mm),
- Die shift vector x, y (mm)
- Distance from COW to center of Reference Die x, y (mm)
- Number of dies per reticle (rows x columns),
- Reticle Street Width & Height (mm)
- Die Street Width & Height (mm)
- **Radius (mm)**
- **Die coordinates (mm) of Locations to be measured**



Output

- Die Index of dies that intersect on a given radius .
- Wafer Coordinates of the measurement locations in the intersecting dies that fall inside the given radius.

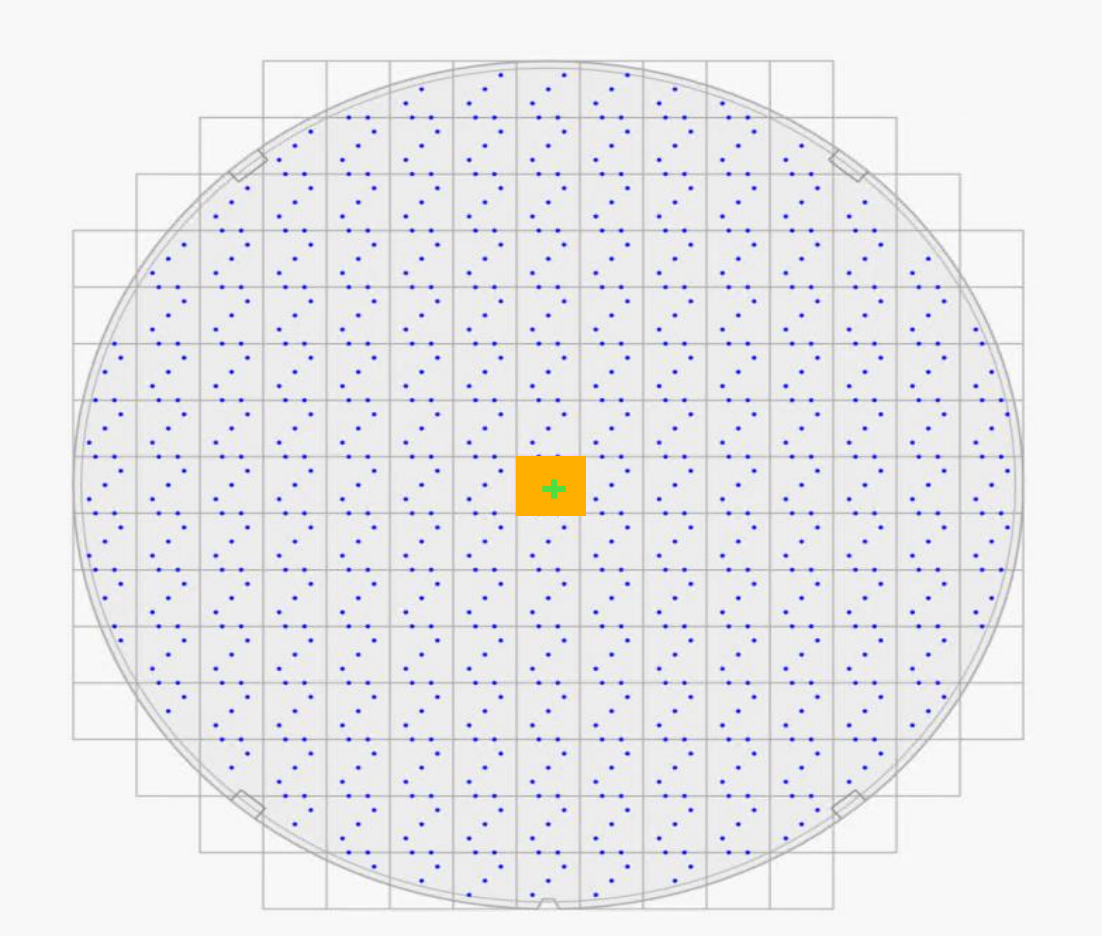
Output Format (in mm)

```
(5,0):(45.1232, 2.3243)

(5,0):(47.1232, -2.3243)

(5,-1):(47.4512, -7.1234)
```

Milestone 5 – find valid die coordinates of Meas. Locs & die index

Input

- Wafer Diameter (mm)
- Die size x, y (mm),
- Die shift vector x, y (mm)
- Distance from COW to Center of Reference Die x, y (mm)
- Number of dies per reticle (rows x columns)
- Reticle Street Width & Height (mm)
- Die Street Width & Height (mm)
- **4 Gripper angles (deg)**
- **Gripper width and height (mm)**
- **Circular Edge exclusion (mm)**
- **List of wafer coordinates to measure (mm)**



Output

- Die Index & die Coordinates of meas. locations available in valid regions.

Output Format (in mm)

```
(0,0):(15.1243, 20.3222)

(2,3):(30.4512, 40.1243)
```

Student guideline

- Student Input Location (Input files, Validation utility, Problem statement pdf, dependent files)
  - FTP link https://fft.kla-tencor.com/login?local=true
    - Username: KLAUniversityWorkshop2024
    - Pwd: KLAUniversityWorkshop-2024

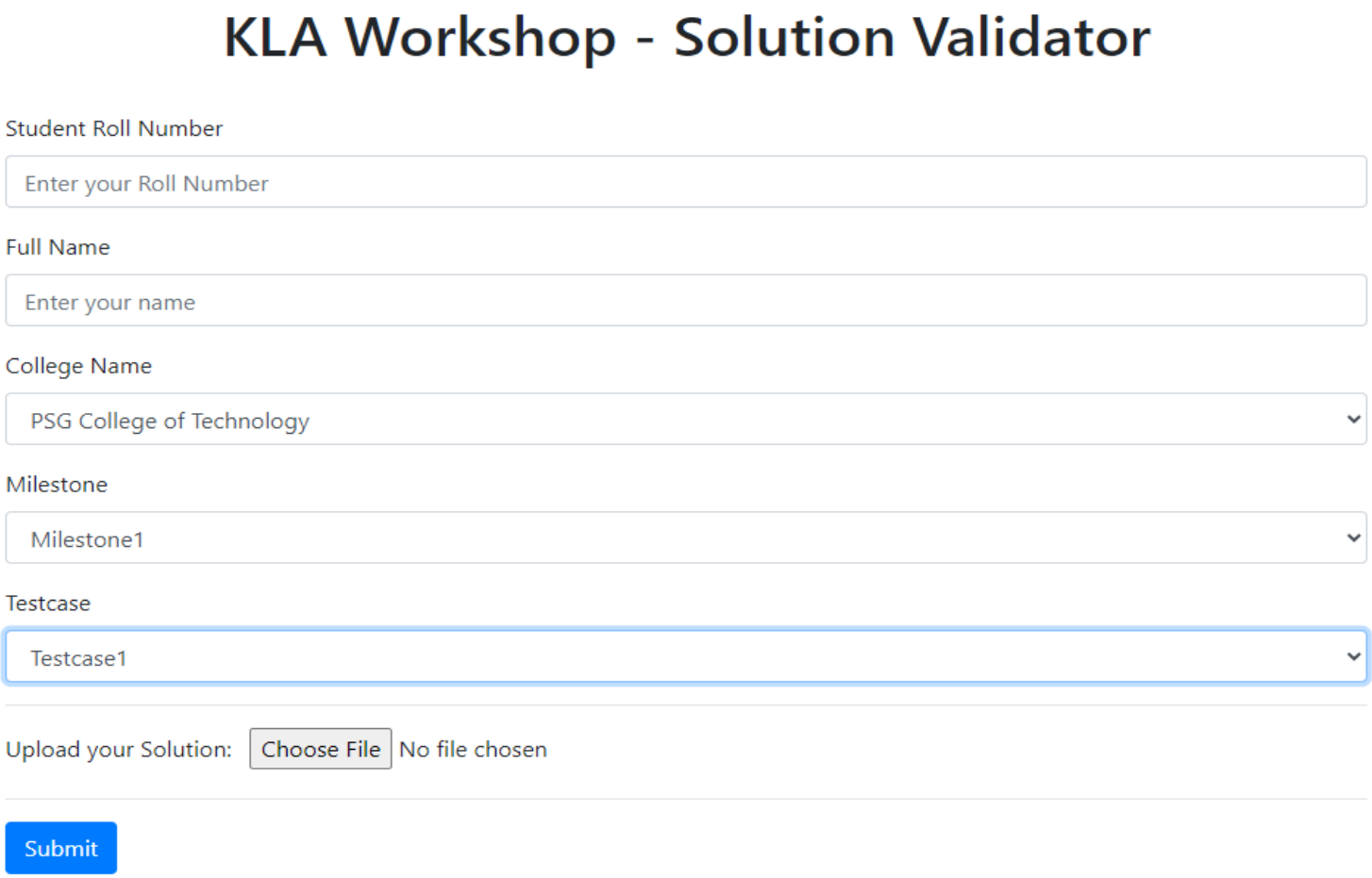
    Install the Aspera plugin extension if required.

- Make a source code check in to git hub every hour / after every milestone.
- Share the Github public repo access to klauniversityworkshophiring@gmail.com

- Use appropriate data structure, class objects & efficient algorithms. Mentors will review the various solution approaches & code quality.

Solution validator

https://klasolutionvalidator2024.azurewebsites.net/



End