Dreams of Automation Technologies

Dreams of Automation Technologies

COMIZOA

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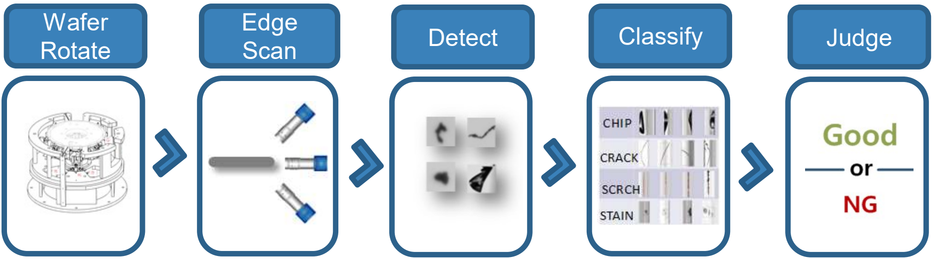
Technologies

Machine Vision and Mechanics

Edge Inspection



Edge Top Camera

Upper Bevel Camera

Apex Camera

Dynamic Folding Edge-grip Finger

Lower Bevel Camera

Edge Bottom Camera

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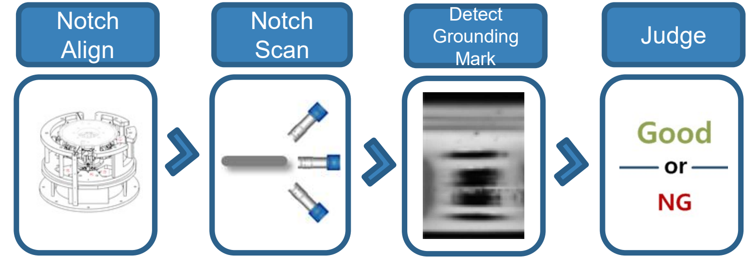
Edge Defect

Defect Type	Defect Image Samples
Chip	
Crack	
Sparkle	
Stain	

Notch Inspection



Upper Bevel Camera

Apex Camera

Notch Inspection

Lower Bevel Camera

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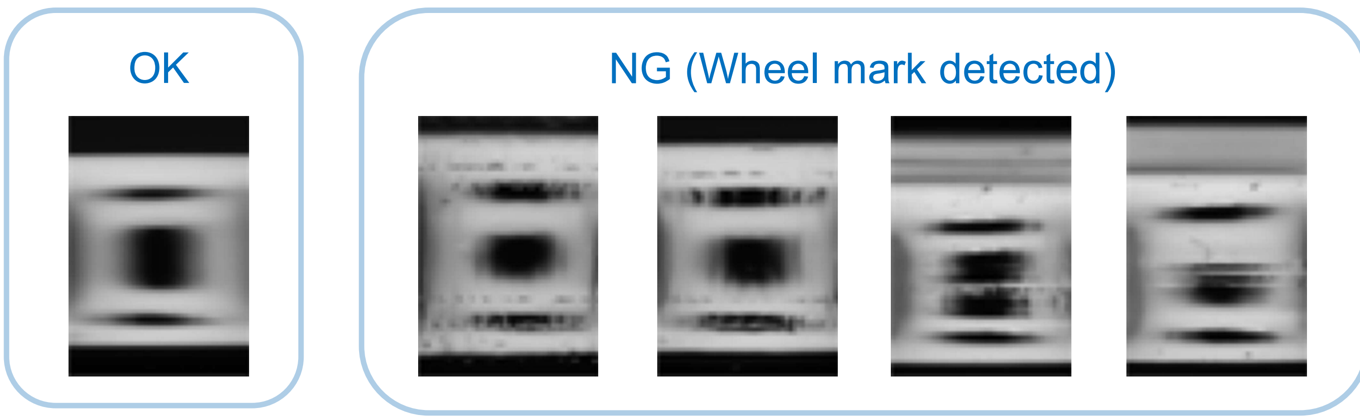
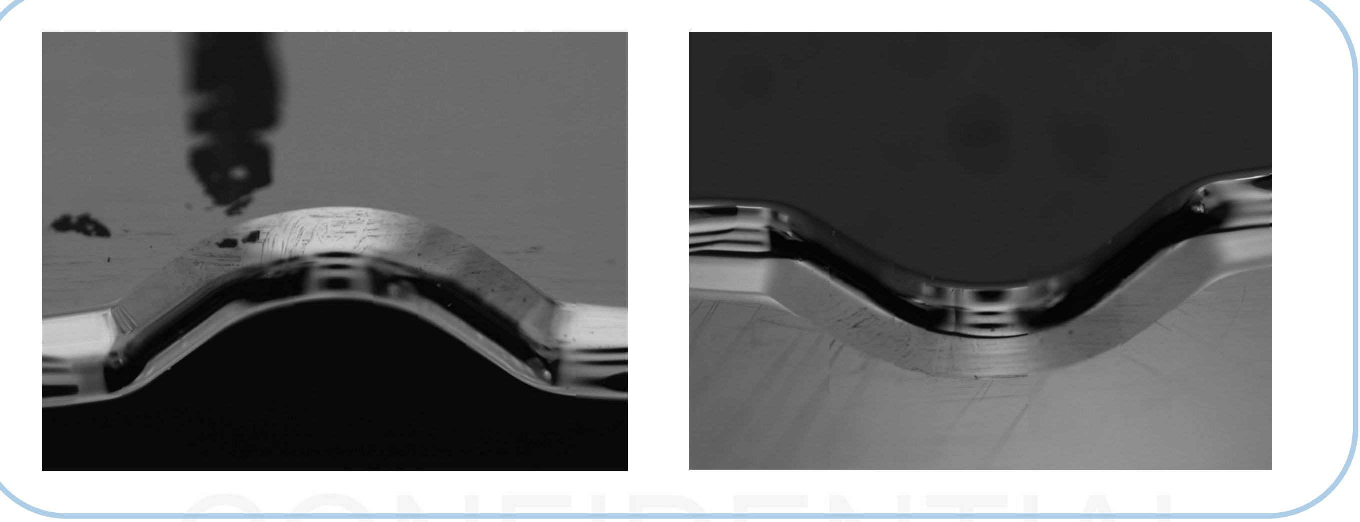
Notch Defect



Notch Apex Images



Upper Bevel Image

Lower Bevel Image

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Surface Inspection

※ Front side & Backside inspection is performed at the same time.

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Surface Defect

41, 69	1, 18, 31, 32, 112, 69, 95	16
Stain	Stain	Stain
72, 112	29, 59	120, 176, 179, 37, 114
Stain	Stain	Stain

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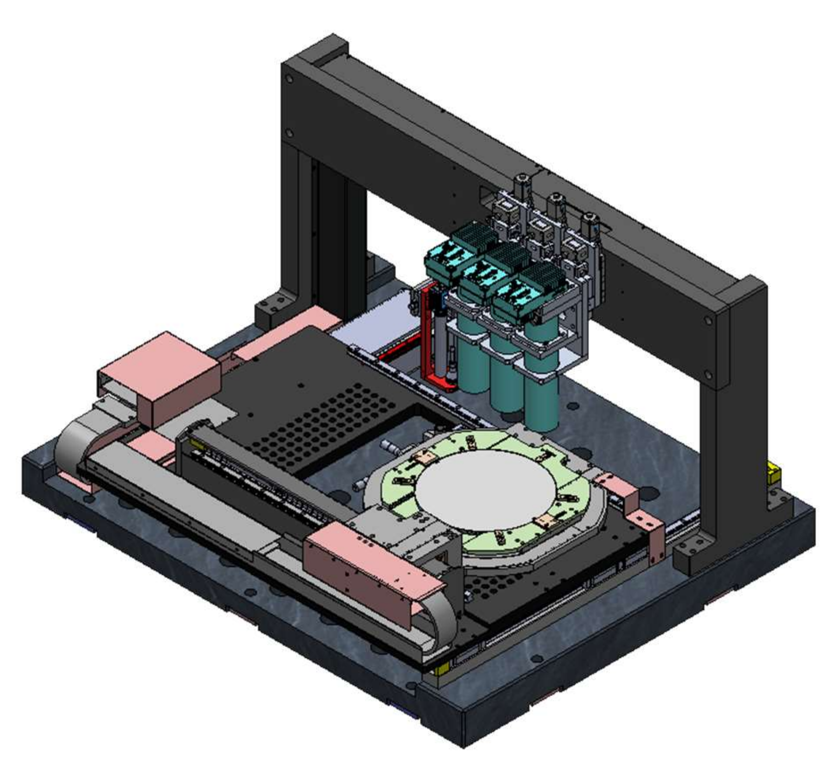
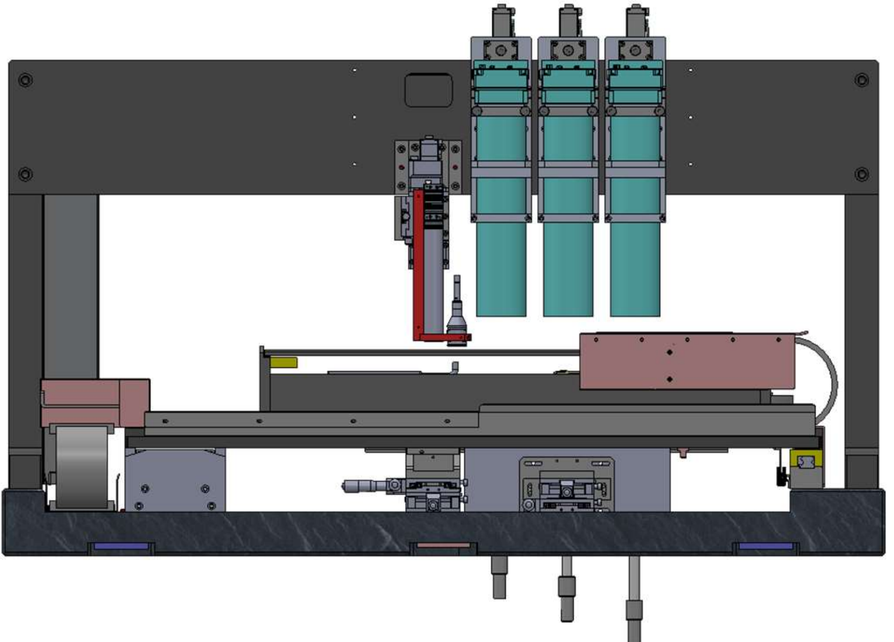
Air-pocket Inspection





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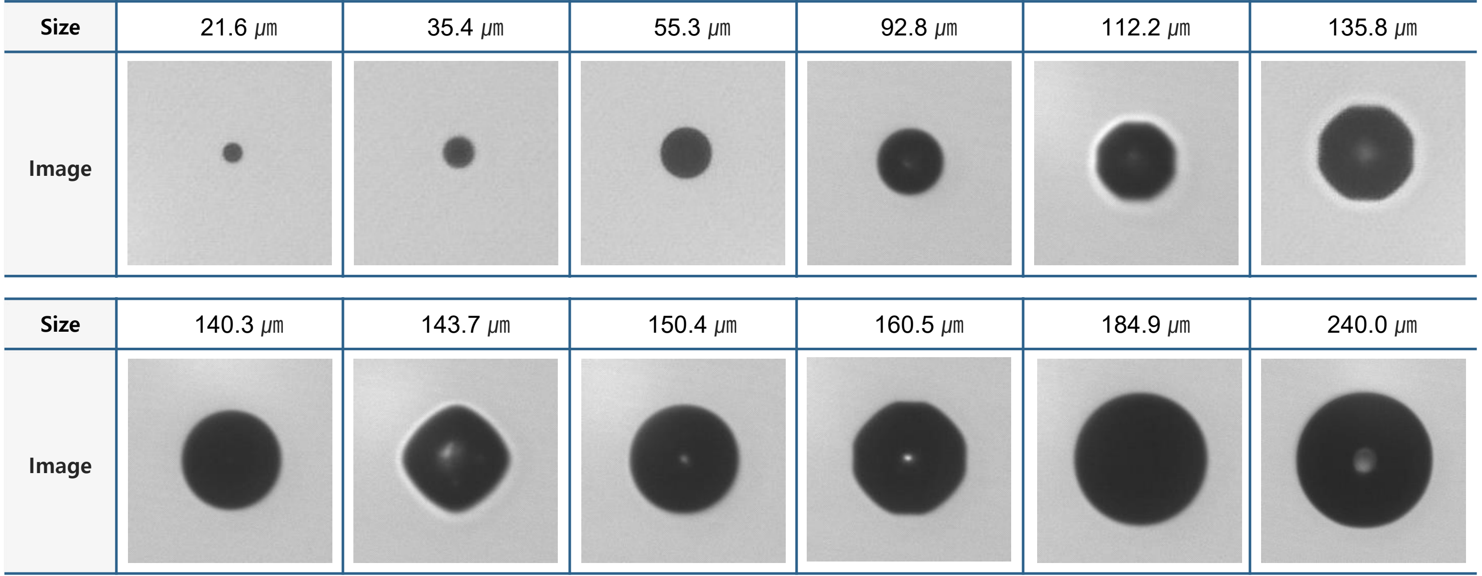
Air-pocket Defect



Size	21.6 ㎛	35.4 ㎛	55.3 ㎛	92.8 ㎛	112.2 ㎛	135.8 ㎛
Image						

Size	140.3 ㎛	143.7 ㎛	150.4 ㎛	160.5 ㎛	184.9 ㎛	240.0 ㎛
Image						

- **Surface-Bump**

Size	102.2 ㎛	107.0 ㎛	111.5 ㎛	115.0 ㎛	120.3 ㎛	134.8 ㎛
Image						

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Fully Automated Vision Calibration

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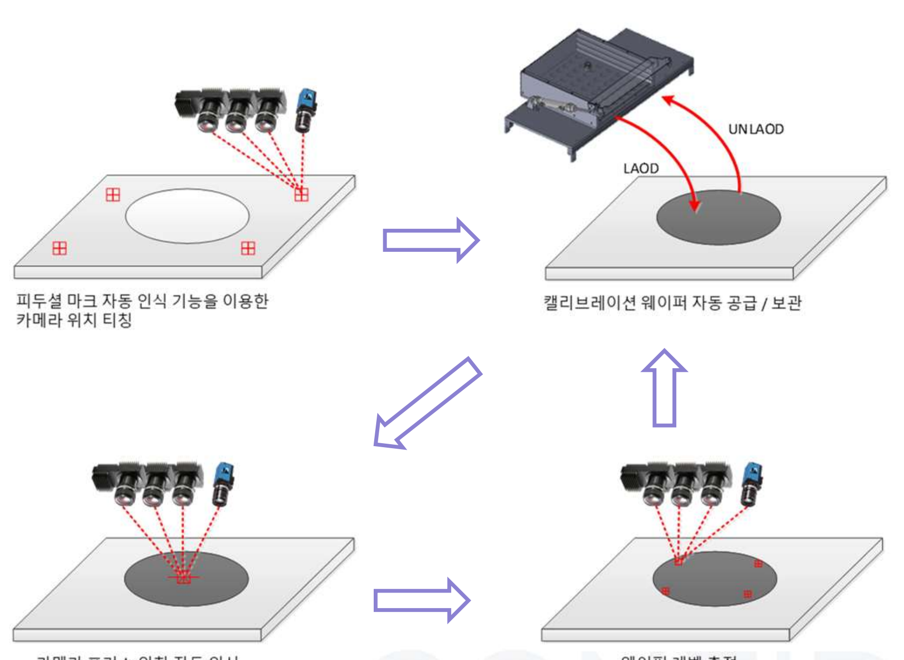
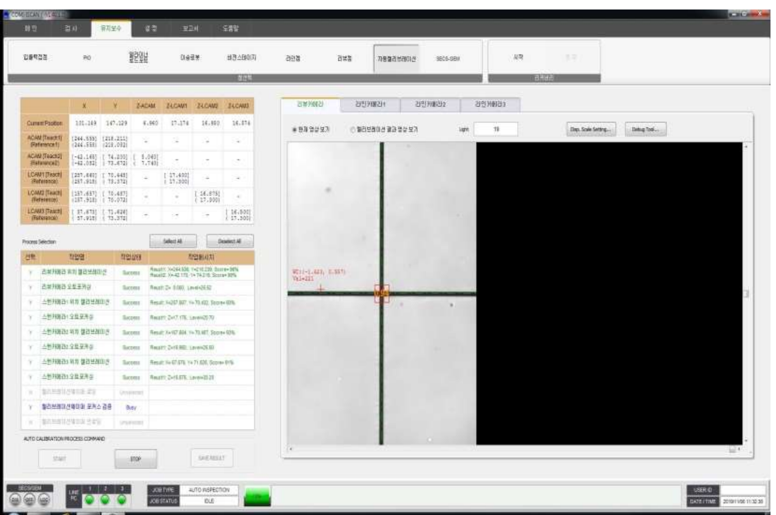
- Vision system calibration jobs are fully automated so that user can do fast and convenient vision calibration.
- Automatic recognition of vision coordinate system by pattern matching technique.
- Automatic recognition of camera focus position
- Automatic measure of wafer level status and alarm if out of range (wafer loading process quality verification)
- Automatic calibration wafer loading/unloading (a buffer station is installed in equipment)
- All the processes are automatically executed at a configured interval





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Calibration wafer & Buffer Stage

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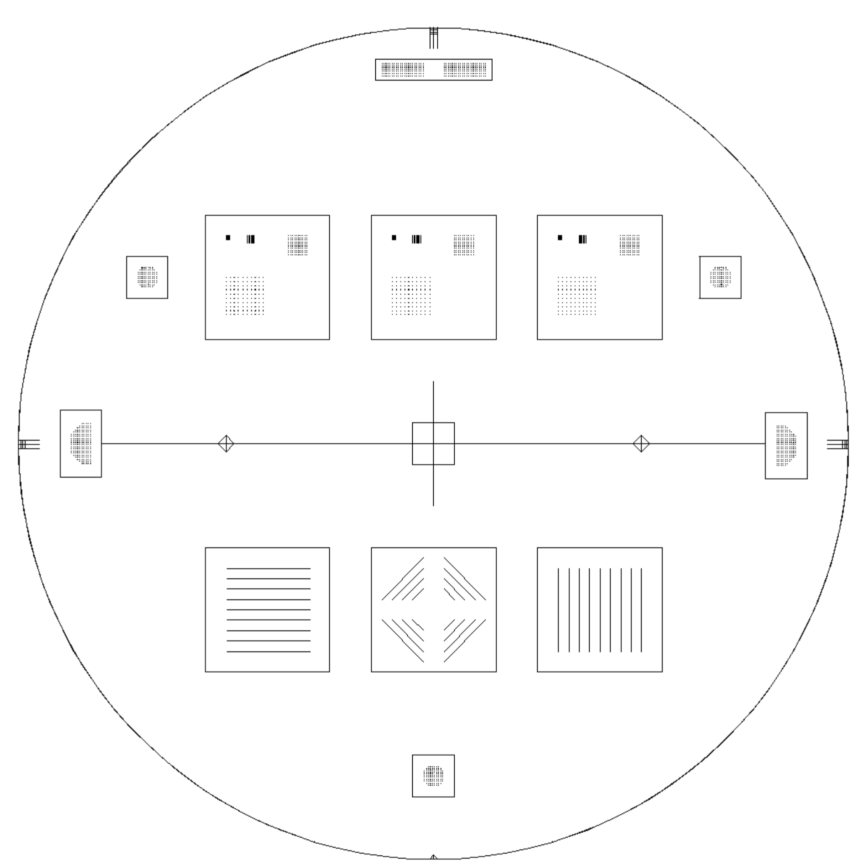
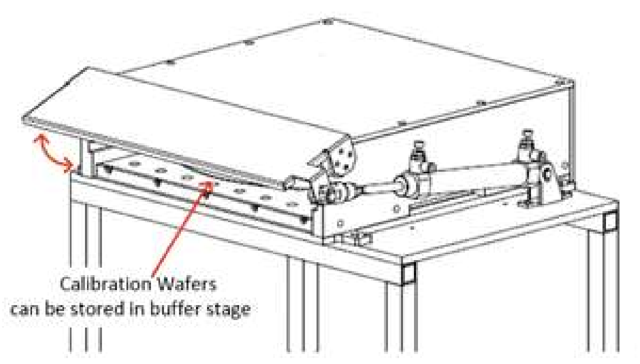


Fully automated setting process using the calibration wafer
=> quick and convenient setup.

* Align vision system and inspection stage.
* Defect detection function calibration.
* Optimize light setting.



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IIM Calibration Wafer v4.00

EIS Calibration Wafer v1.00

Black : Surface
Red : Backside

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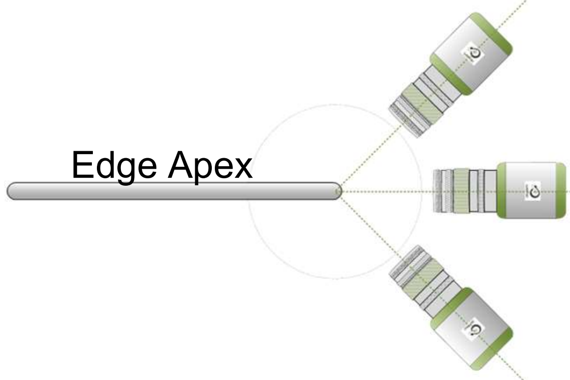
Edge Images A

Wafer Type 1 (Wide Bevel)

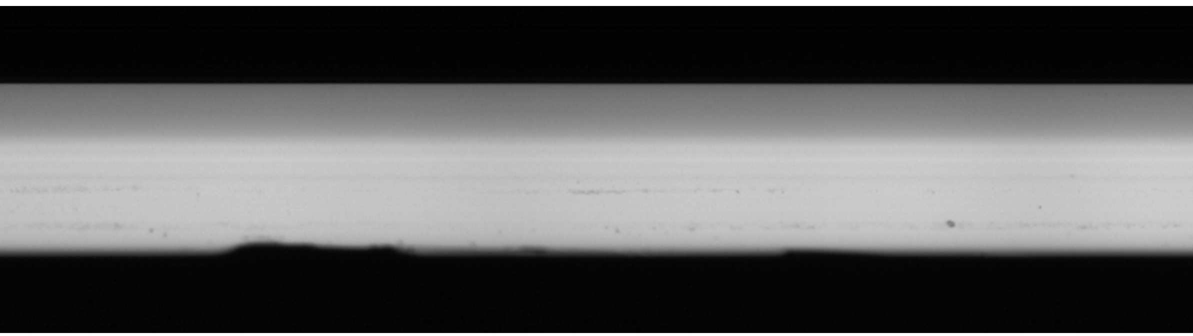
Edge Upper Bevel

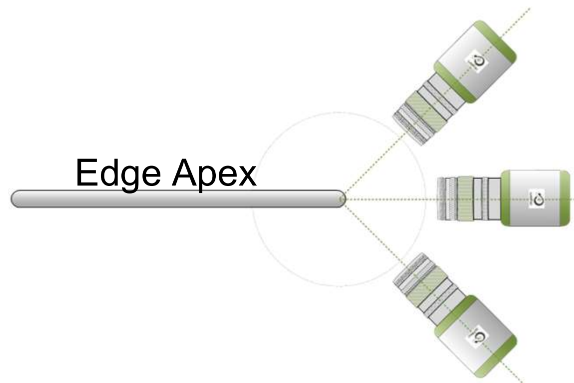


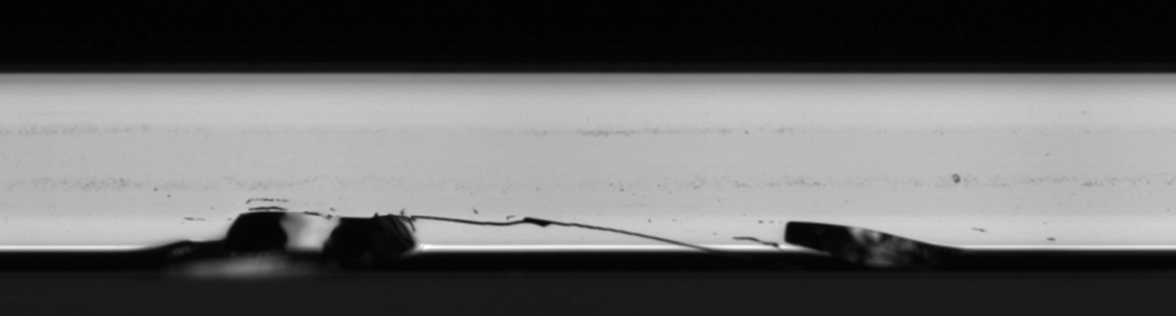
Edge Lower Bevel

Edge Images B

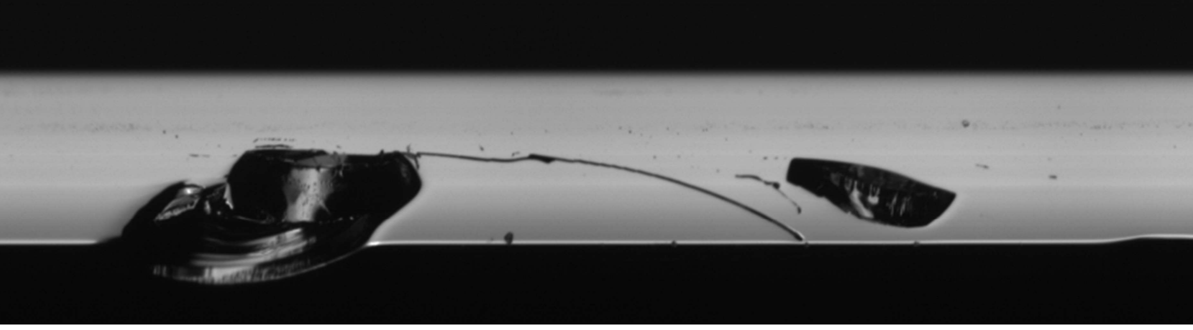
Wafer Type 2 (Narrow Bevel)







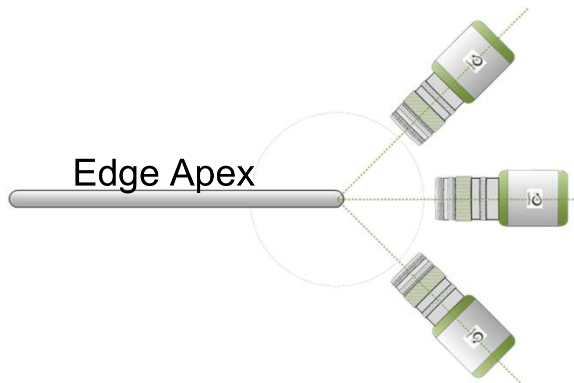
Edge Lower Bevel

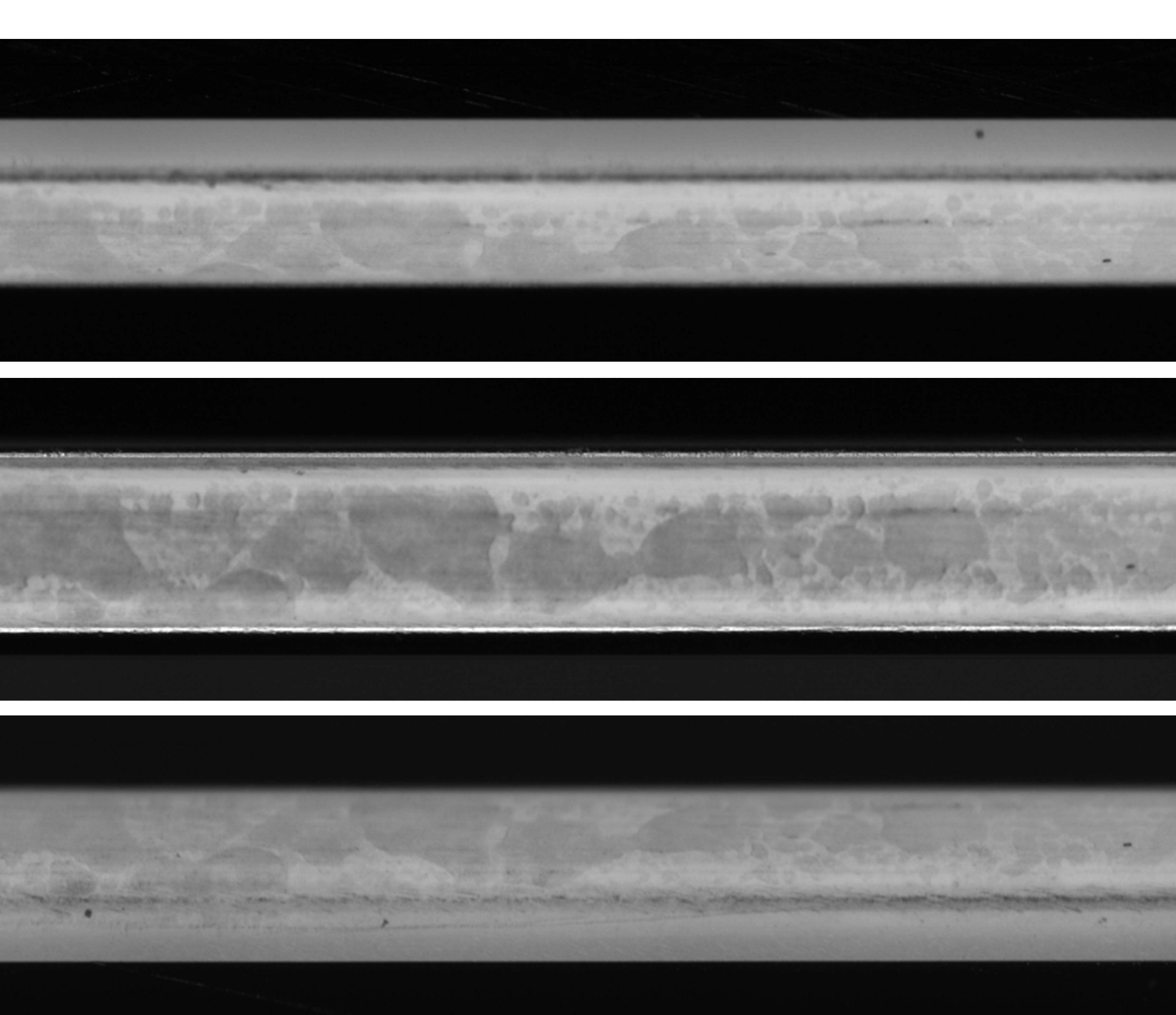


Edge Images C

Wafer Type 3 (Ground)

Edge Upper Bevel

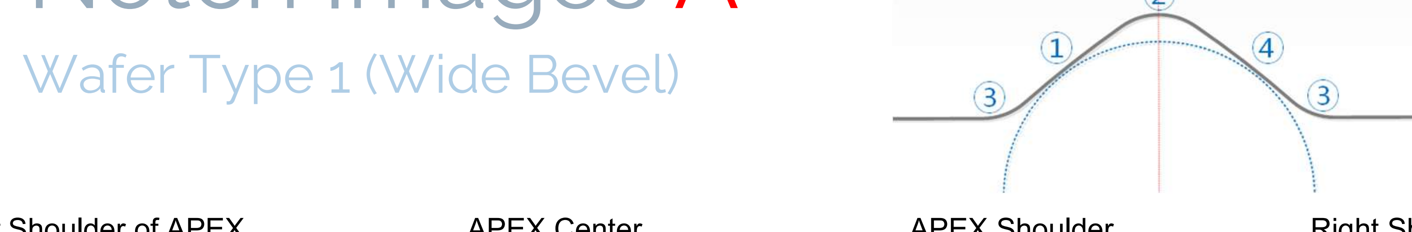




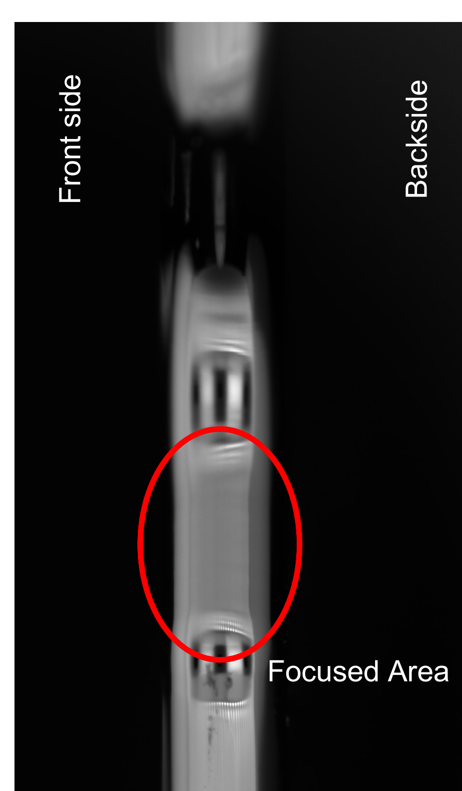
Edge Lower Bevel

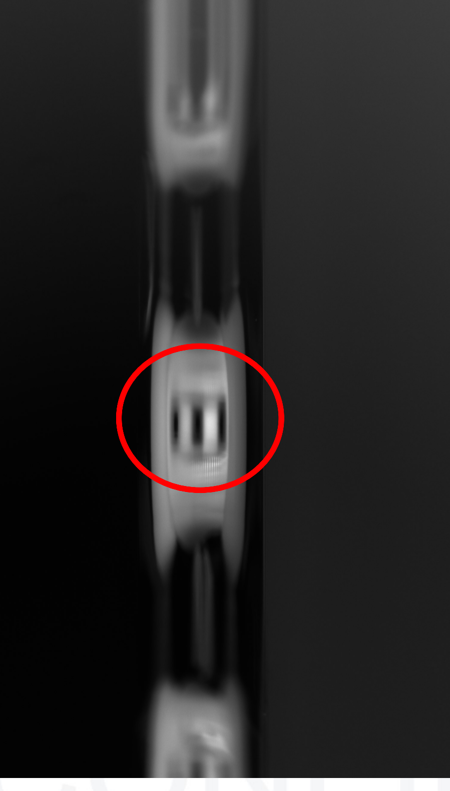
Notch Images A

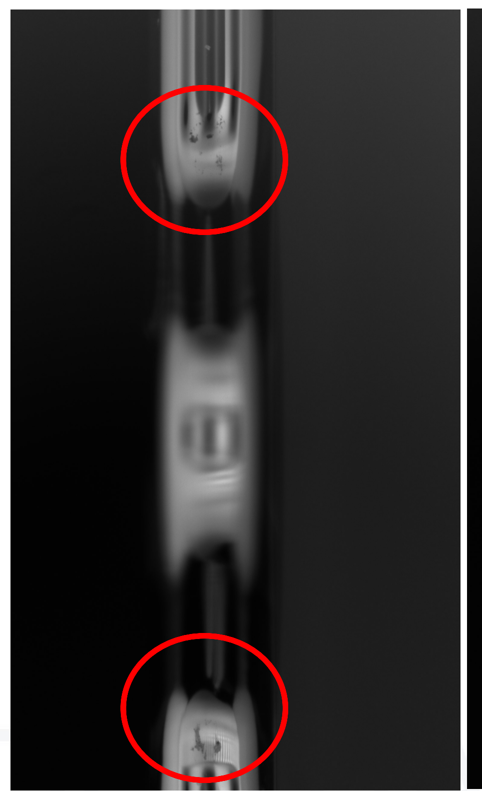
Wafer Type 1 (Wide Bevel)



Left Shoulder of APEX Focused ①	APEX Center Focused ②	APEX Shoulder Focused ③	Right Shoulder of APEX Focused ④







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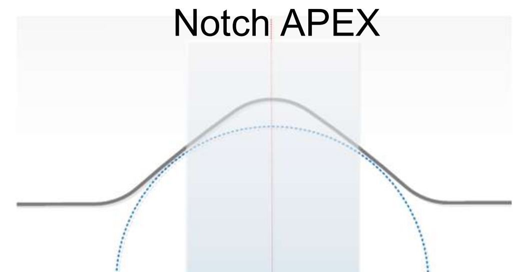
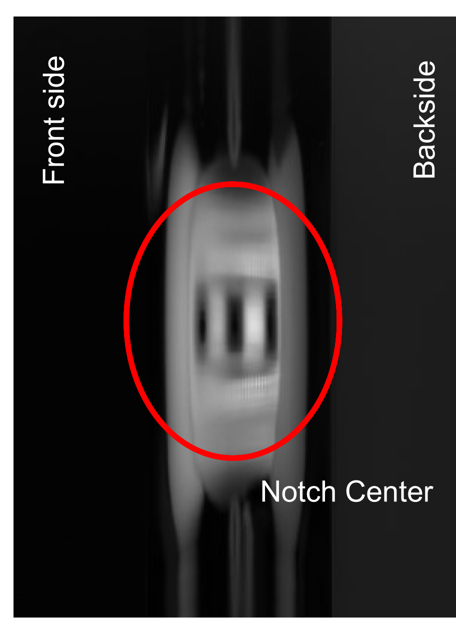
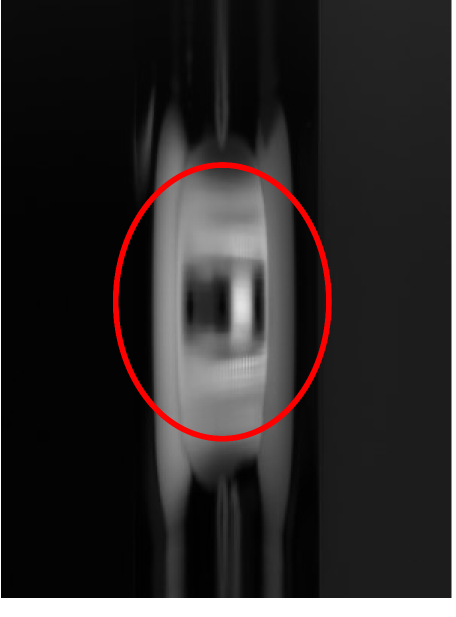
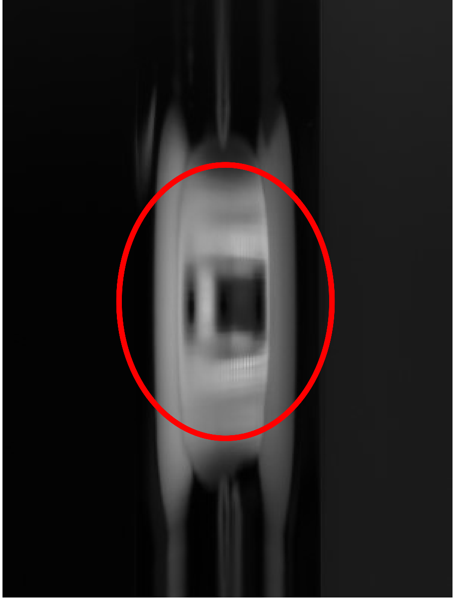
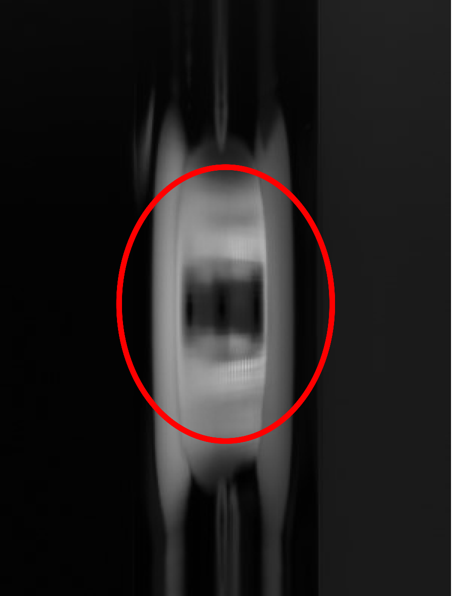
Notch Images A

Wafer Type 1 (Wide Bevel)

Notch APEX (Dark Field)



Dark Field Condition 1	Dark Field Condition 2	Dark Field Condition 3	Dark Field Condition 4
			

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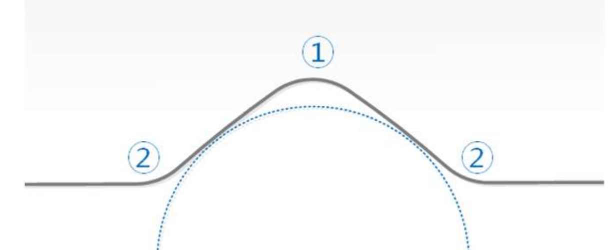
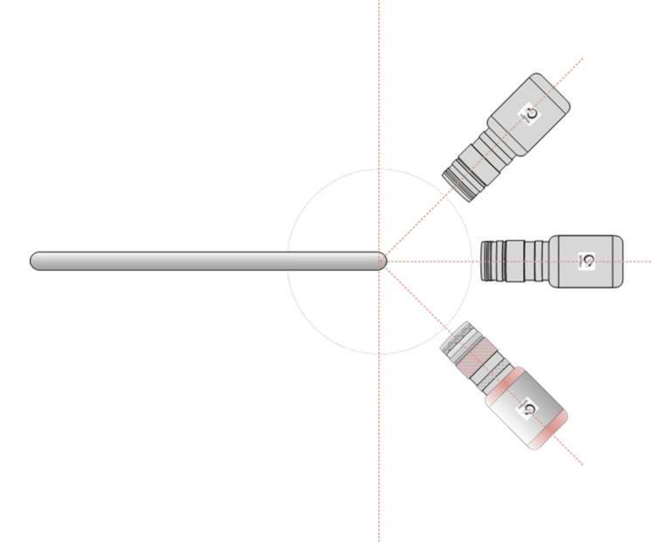
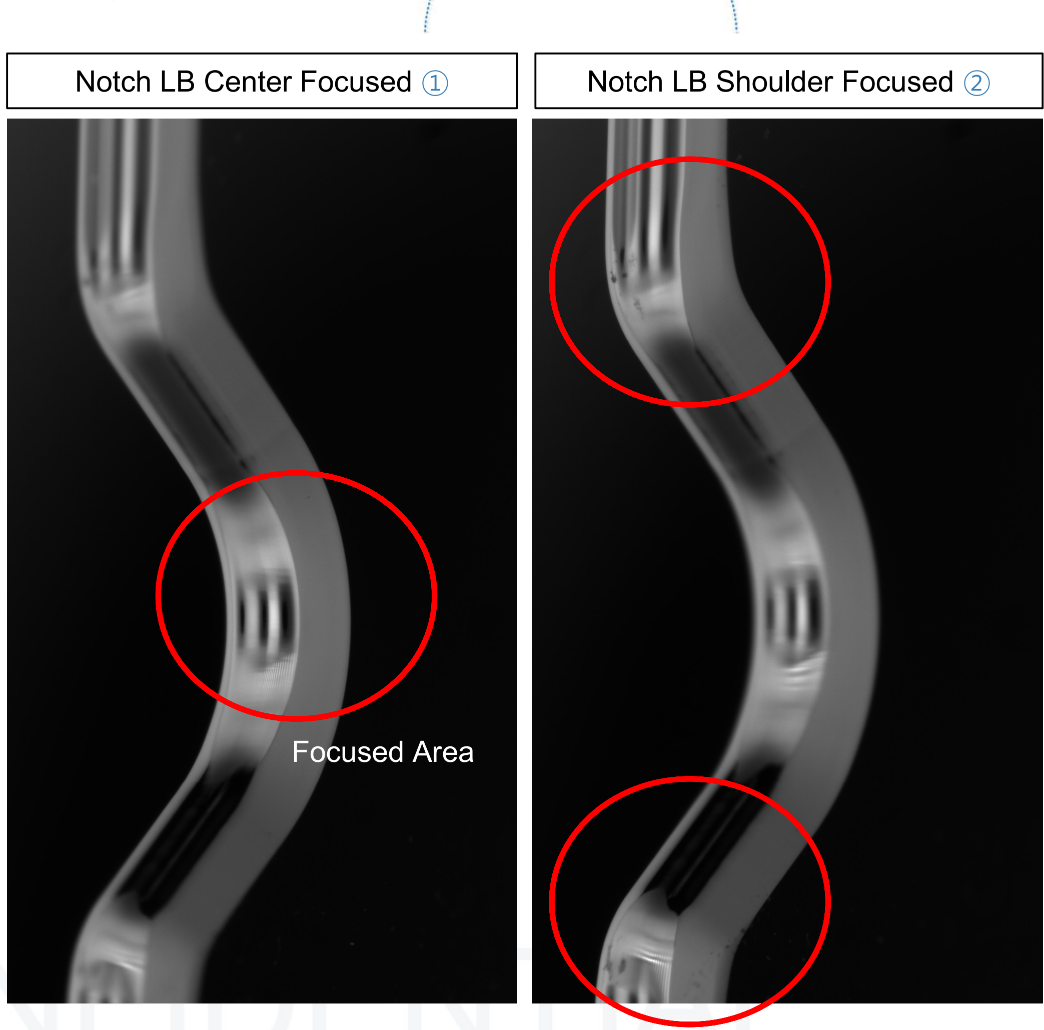
Notch Images A

Wafer Type 1 (Wide Bevel)



Notch Lower Bevel





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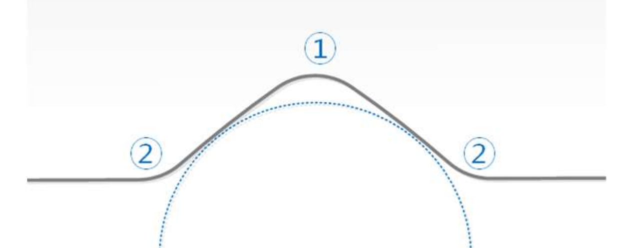
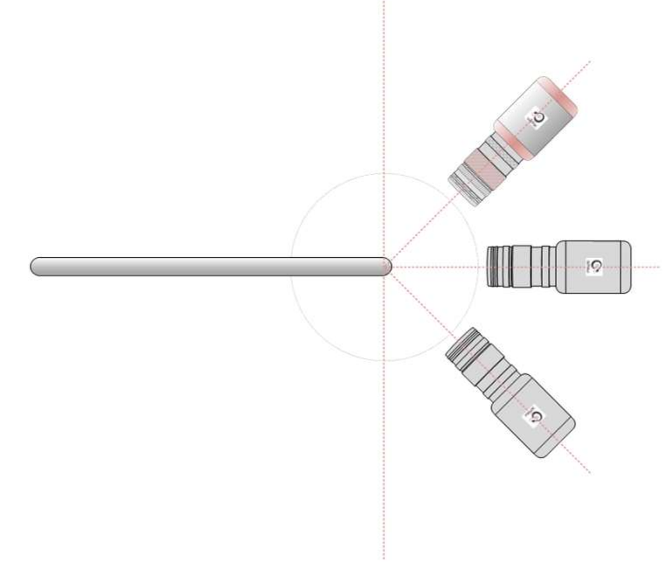
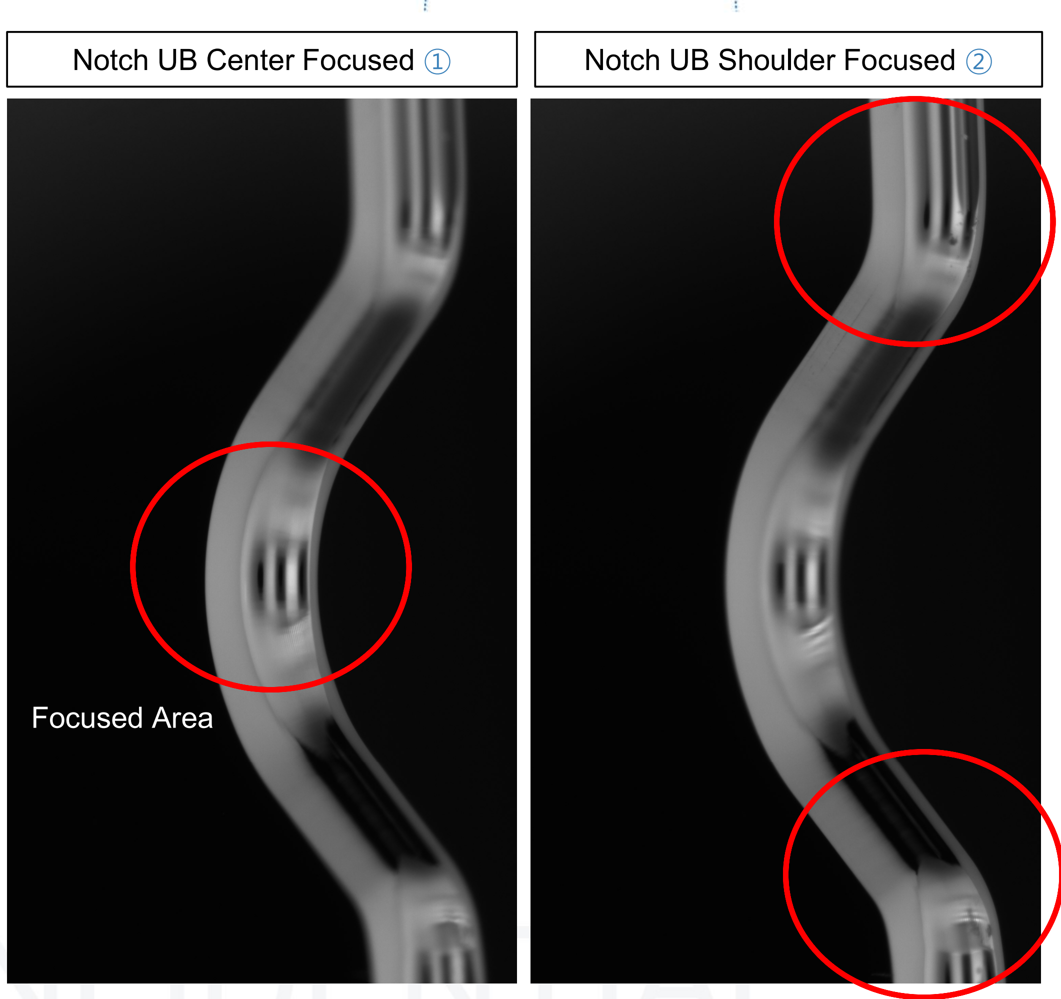
Notch Images A

Wafer Type 1 (Wide Bevel)



Notch Upper Bevel





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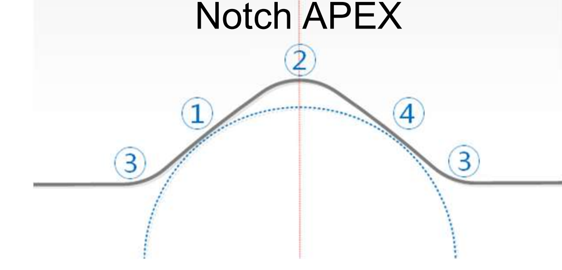
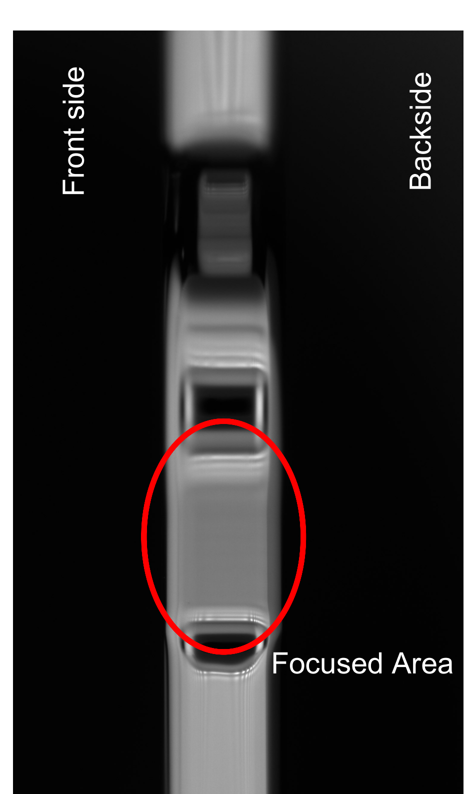
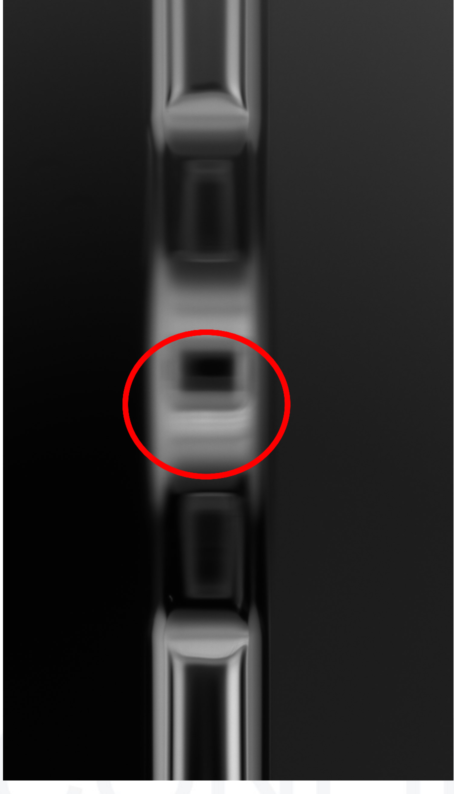
Notch Images B

Wafer Type 2 (Narrow Bevel)



Left Shoulder of APEX Focused ①	APEX Center Focused ②	APEX Shoulder Focused ③	Right Shoulder of APEX Focused ④





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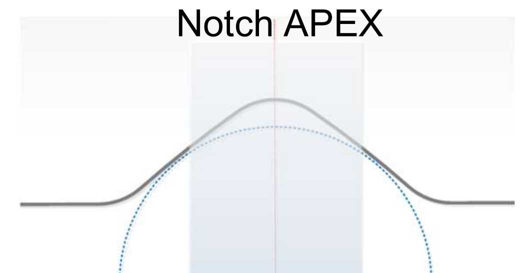
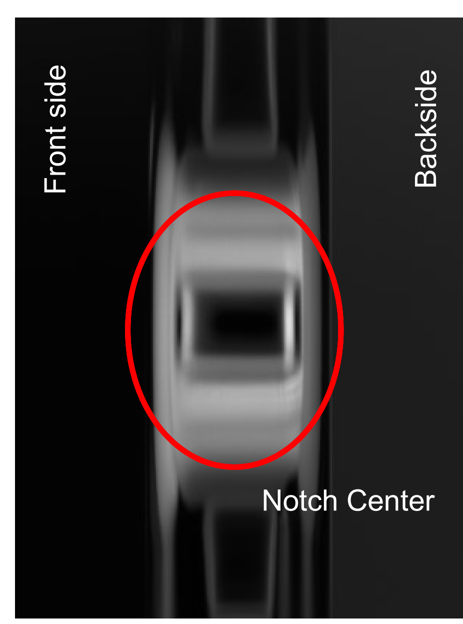
Notch Images B

Wafer Type 2 (Narrow Bevel)

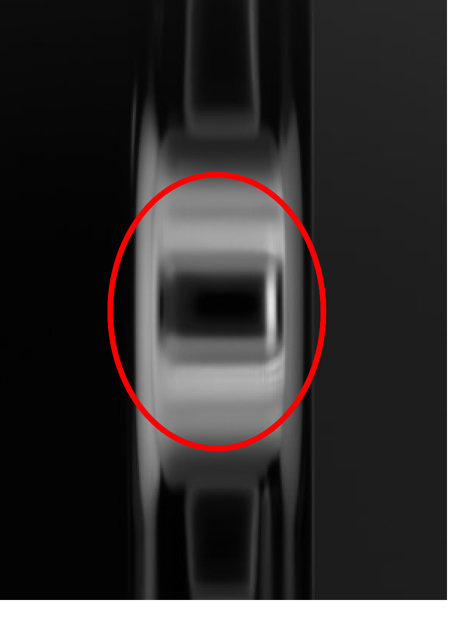
Notch APEX (Dark Field)



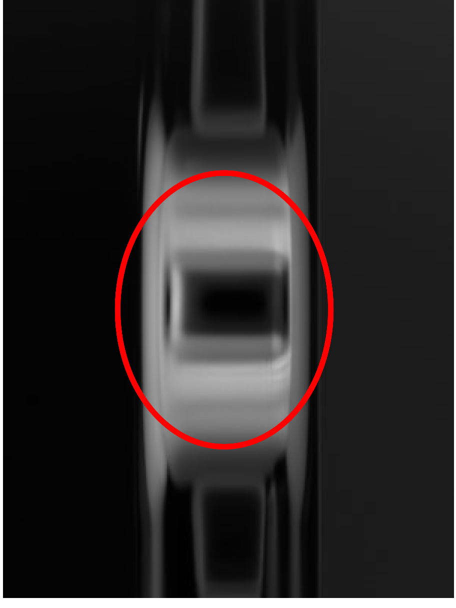
Dark Field Condition 1



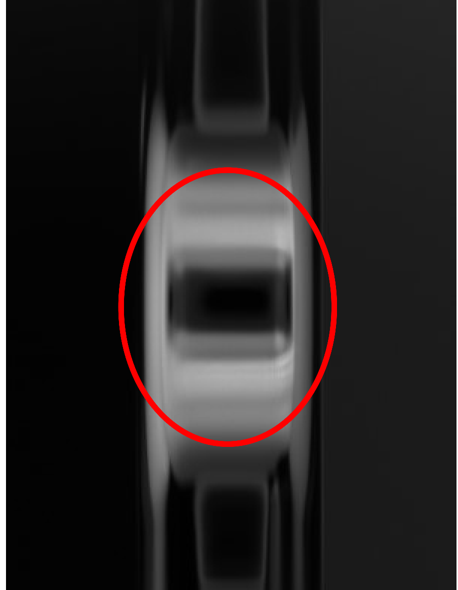
Dark Field Condition 2



Dark Field Condition 3



Dark Field Condition 4



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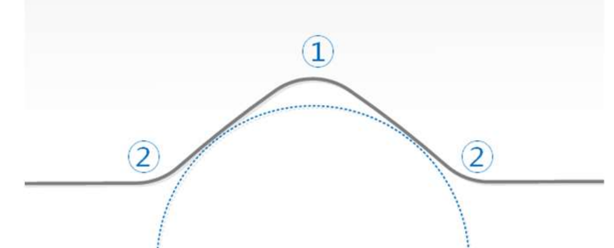
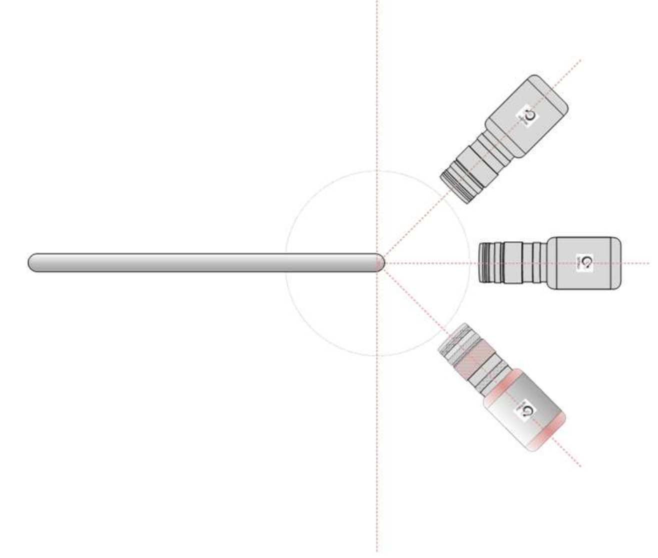
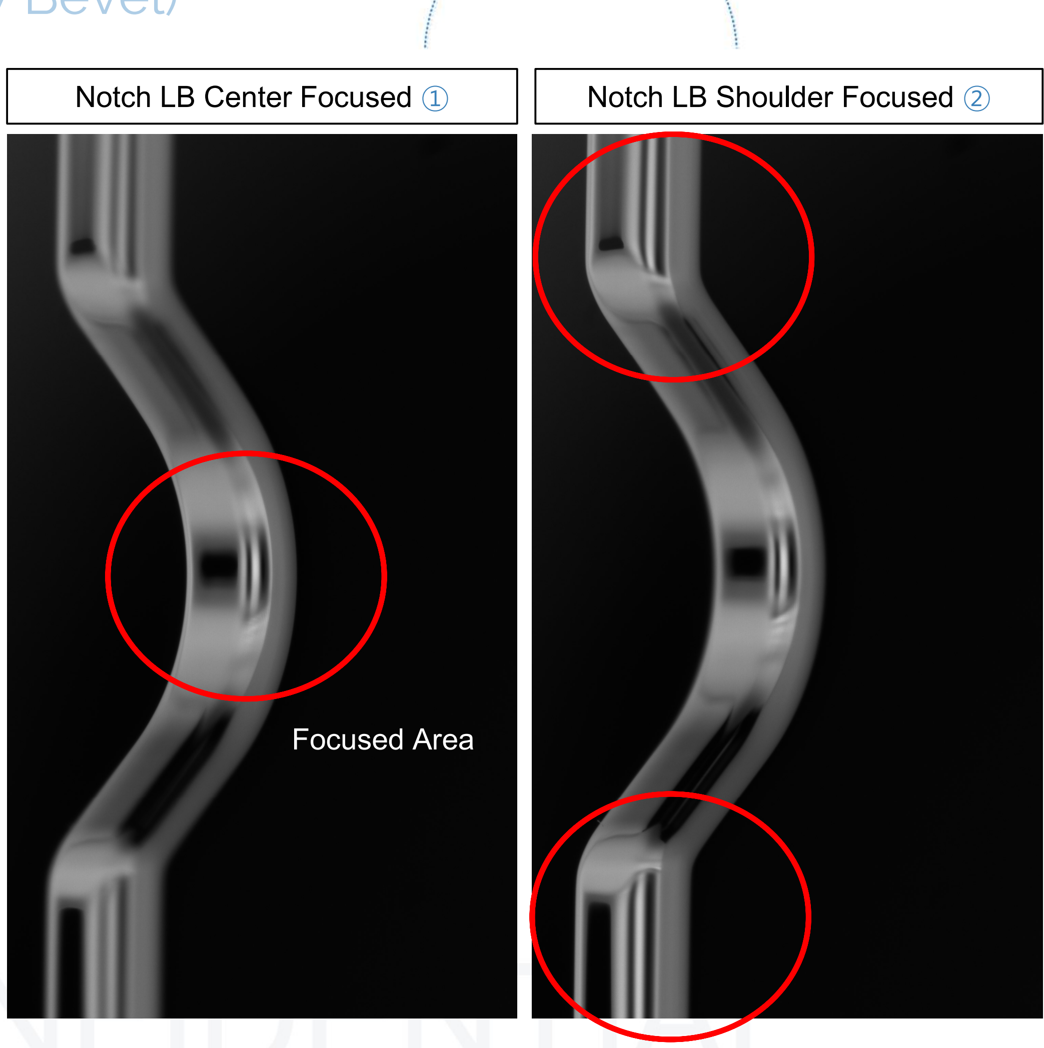
Notch Images B

Wafer Type 2 (Narrow Bevel)



Notch Lower Bevel





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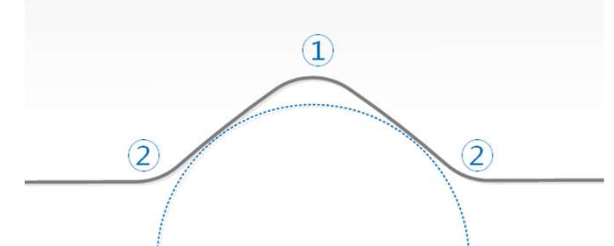
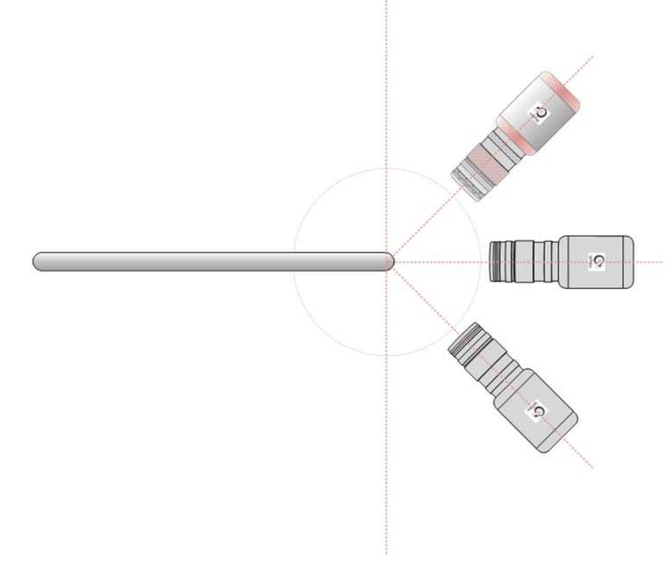
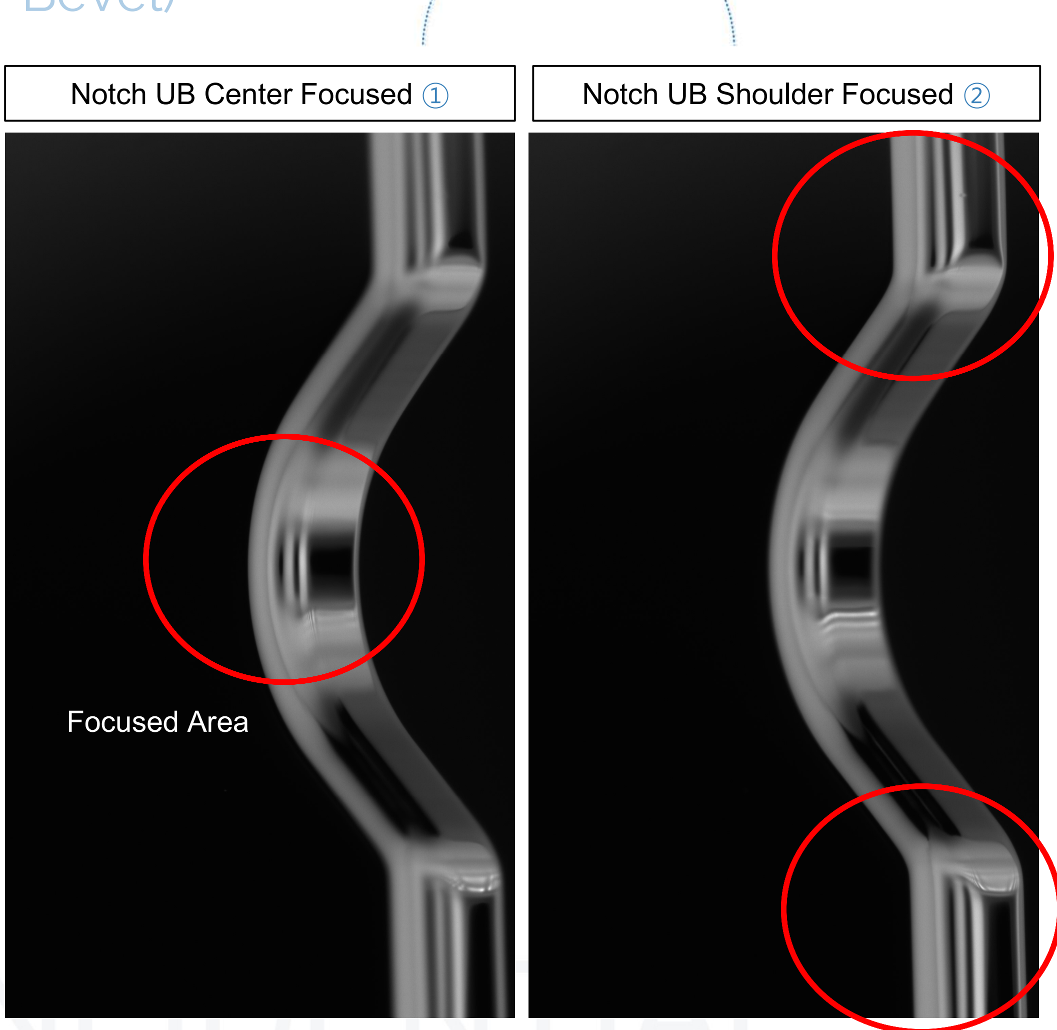
Notch Images B

Wafer Type 2 (Narrow Bevel)



Notch Upper Bevel





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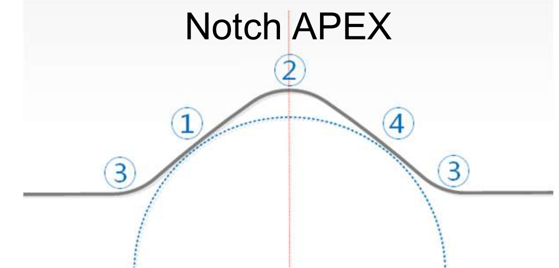
Notch Images C

Wafer Type 3 (Ground Wafer)

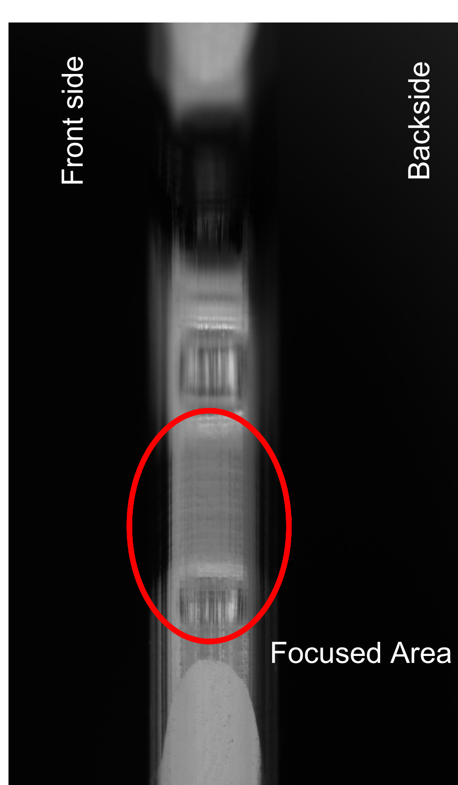


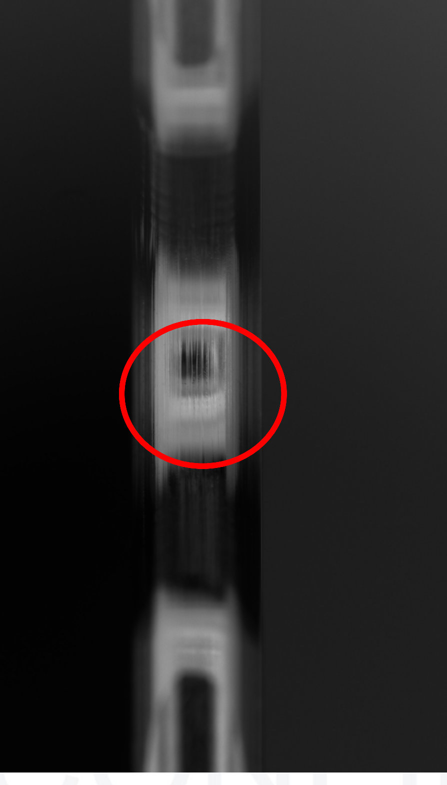
Left Shoulder of APEX Focused ①

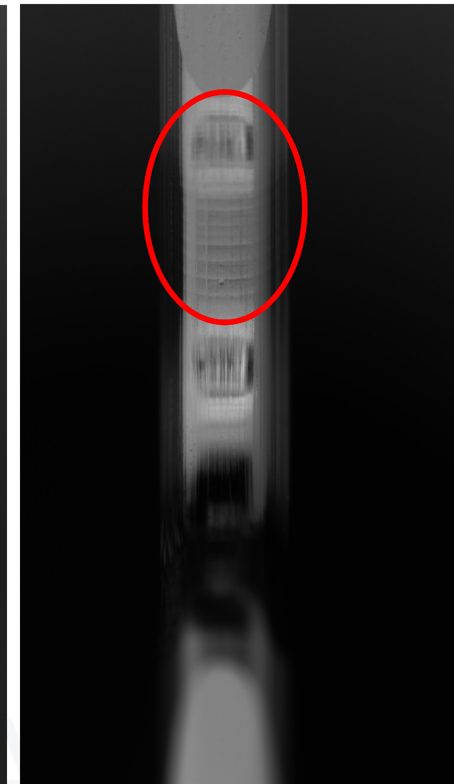
APEX Center Focused ②

APEX Shoulder Focused ③

Right Shoulder of APEX Focused ④







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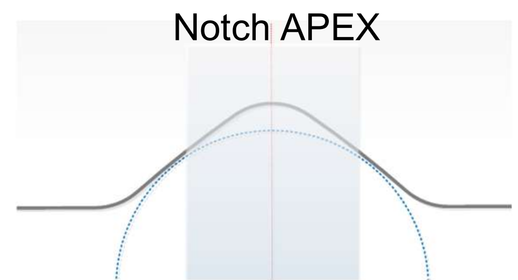
Notch Images C

Wafer Type 3 (Ground Wafer)



Notch APEX (Dark Field)

Dark Field Condition 1	Dark Field Condition 2	Dark Field Condition 3	Dark Field Condition 4

Front side

Backside

Notch Center

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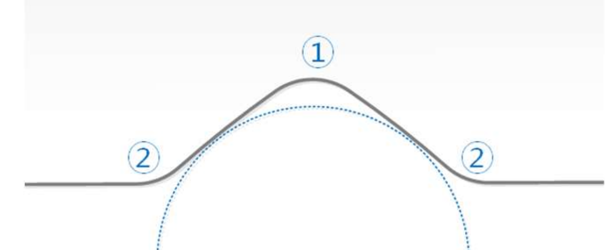
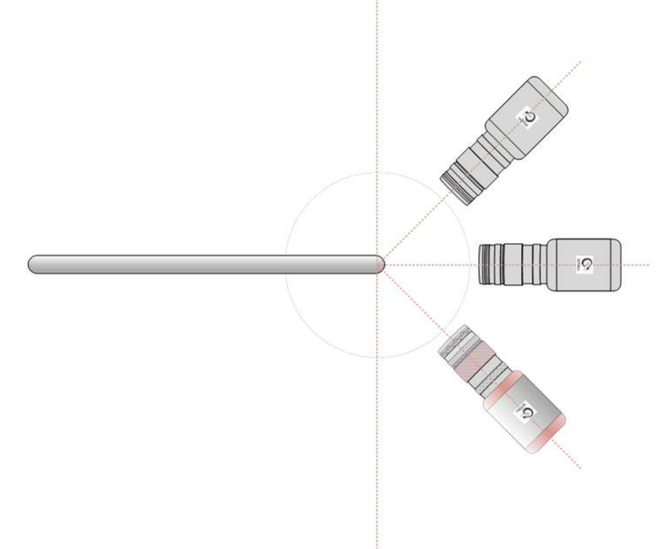
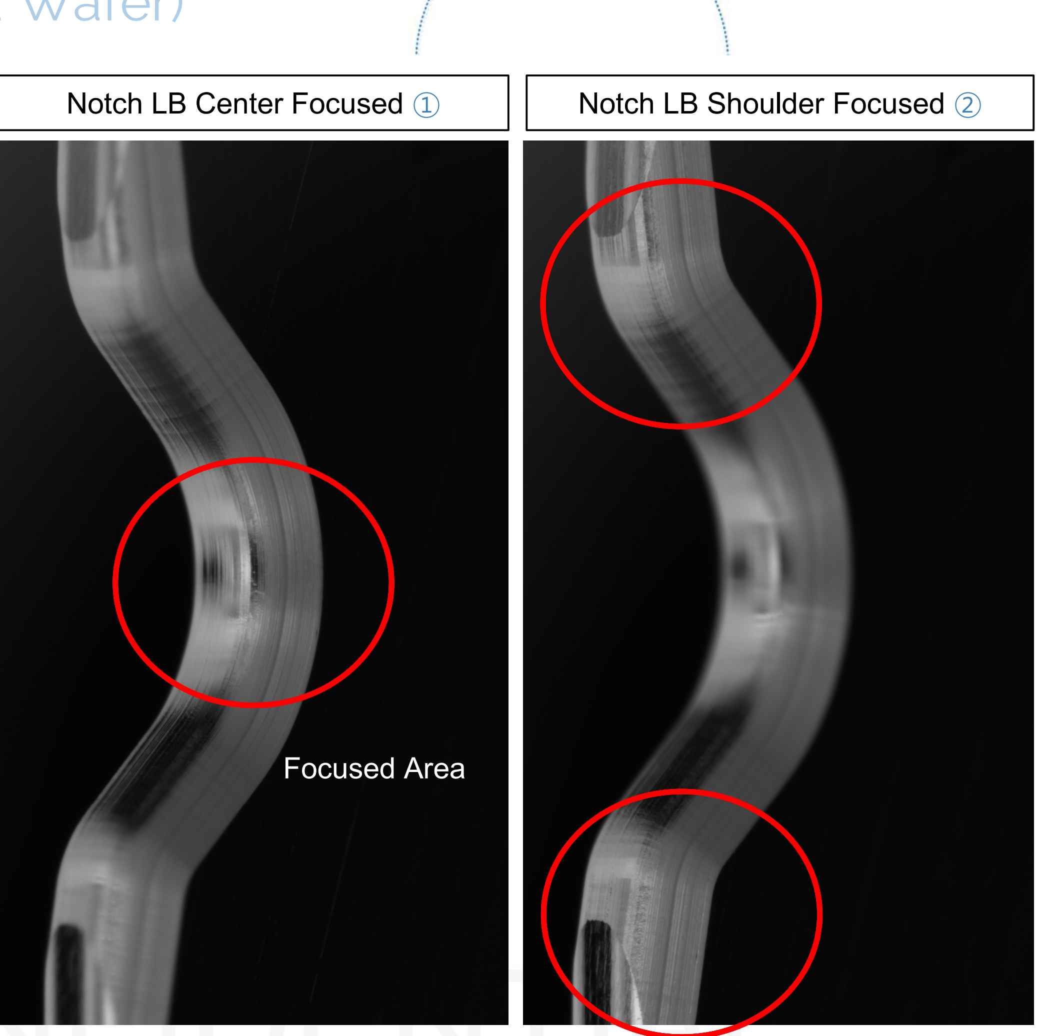
Notch Images C

Wafer Type 3 (Ground Wafer)



Notch Lower Bevel





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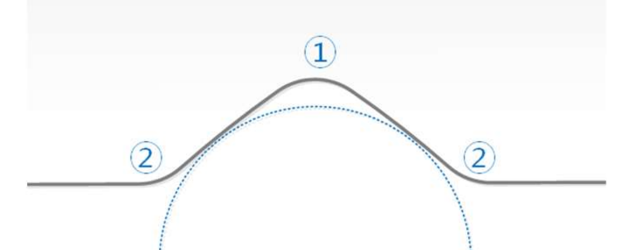
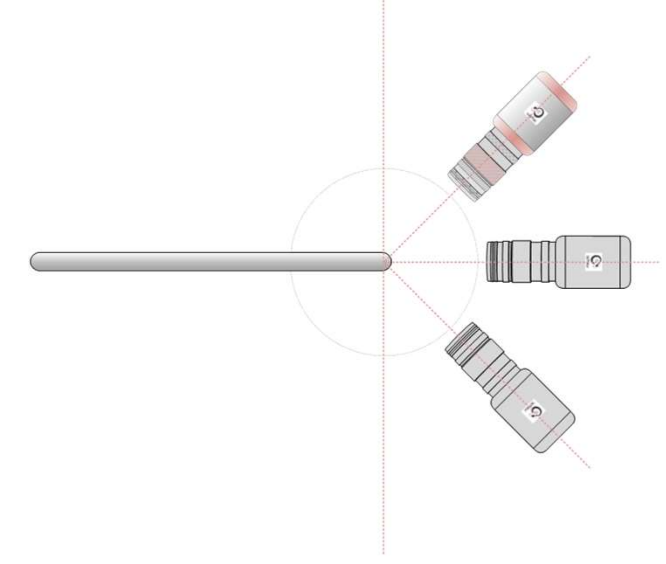
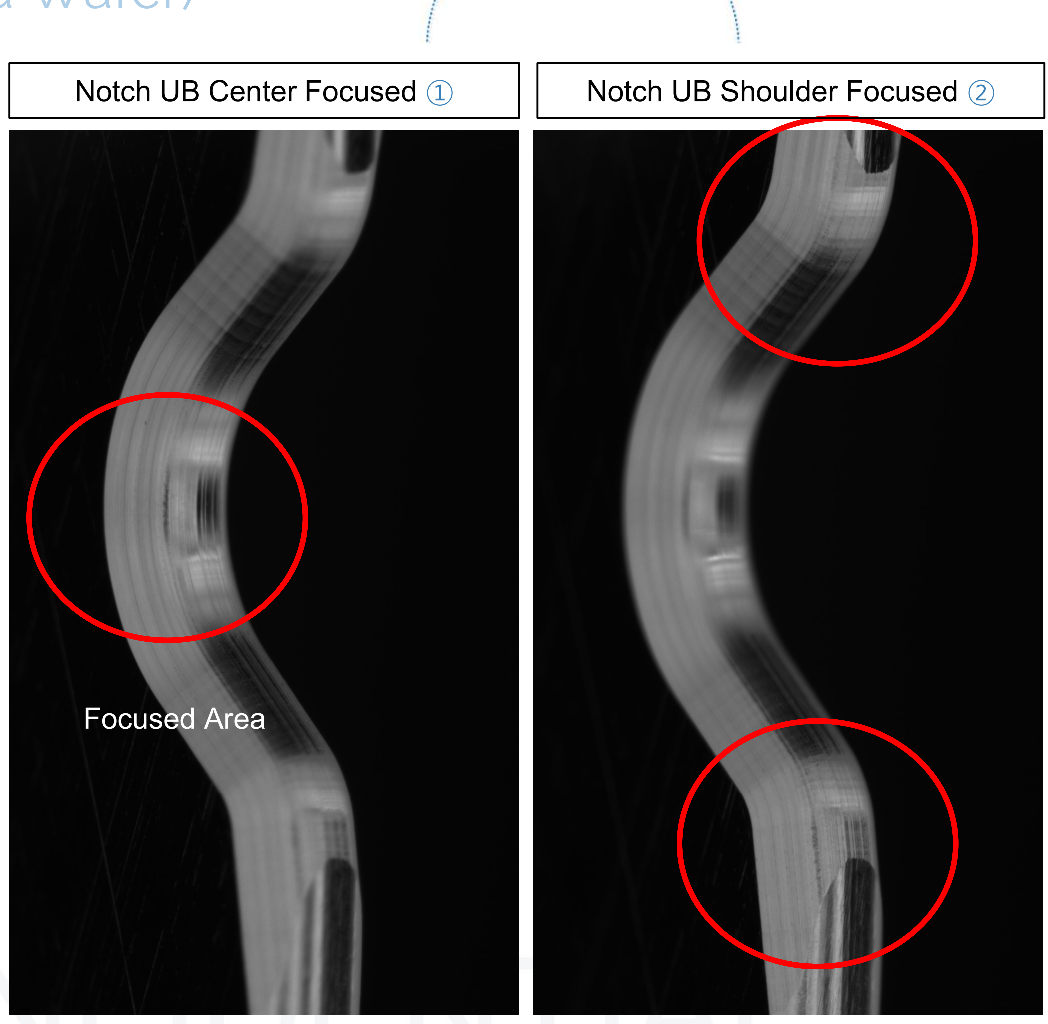
Notch Images C

Wafer Type 3 (Ground Wafer)



Notch Upper Bevel





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Throughput

Edge					Notch			Back Side	Front Side			T/P (sec/wafer)	T/P (wafer/h)
Apex	Upper Bevel	Lower Bevel	Edge Top	Edge Bottom	Apex	Upper Bevel	Lower Bevel		Dark Field	Bright Field	Pit		
○	○	○										40	90
○	○	○	○	○								40	90
○	○	○			○	○	○					40	90
○	○	○	○	○	○	○	○					40	90
○	○	○						○				43	83
○	○	○	○	○				○				43	83
○	○	○			○	○	○	○				43	83
○	○	○	○	○	○	○	○	○				43	83
○	○	○						○	○	○		43	83
○	○	○	○	○				○	○	○		43	83
○	○	○			○	○	○	○	○	○		43	83
○	○	○	○	○	○	○	○	○	○	○		43	83
○	○	○						○	○	○	○	45	80
○	○	○	○	○				○	○	○	○	45	80
○	○	○			○	○	○	○	○	○	○	45	80
○	○	○	○	○	○	○	○	○	○	○	○	45	80

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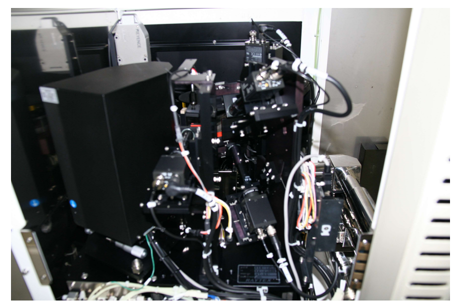
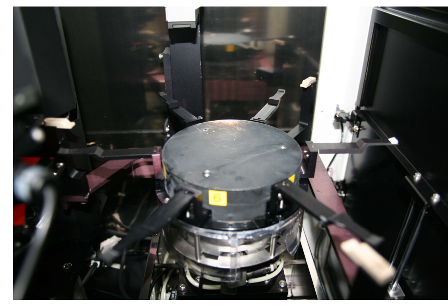
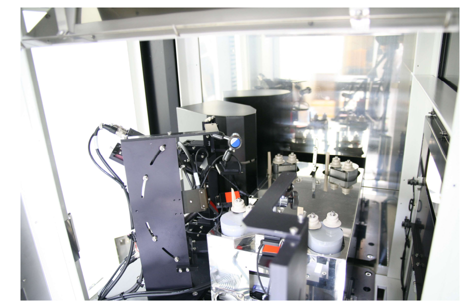
A Company

Comparision

Edge Optics







Two rotations of the edge scan is required to scan edge grip area.
It is difficult to set up and maintenance because five cameras and illuminations are installed separately.

Difficulty classifying defects due to low camera specifications and laser scan method.

Auto Focusing Function is not supported.

Long time setup and Non-uniform performance between equipment because there is no Edge calibration wafer.

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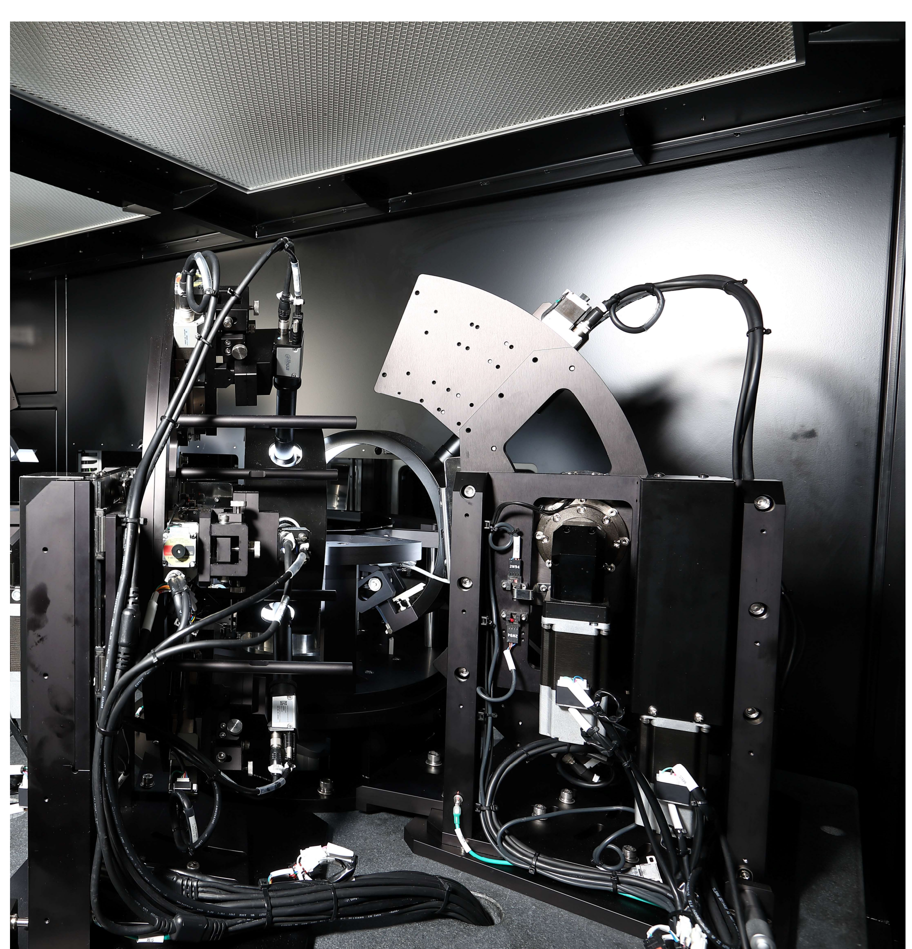
COMIZOA

Edge Optics



Singe Turn Edge Inspection by using Dynamic folding edge grip fingers.

The High Uniformity between the five camera image sensors Sensitivity.

Setup and maintenance are easy with the automatic focusing and automatic alignment function of the camera unit.

Combined illumination unit.

Edge damage and pollution risk are minimized by optimized contact area.

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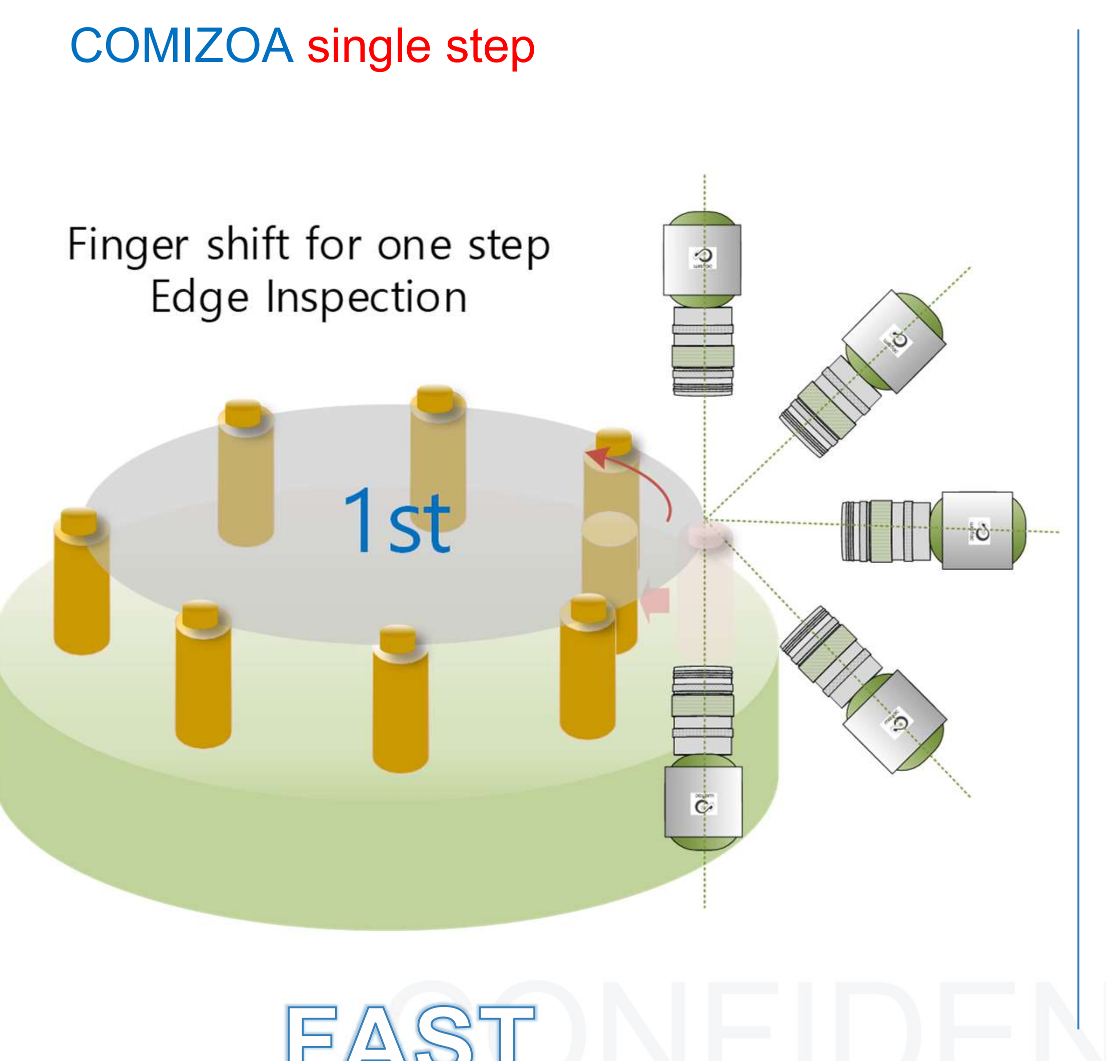
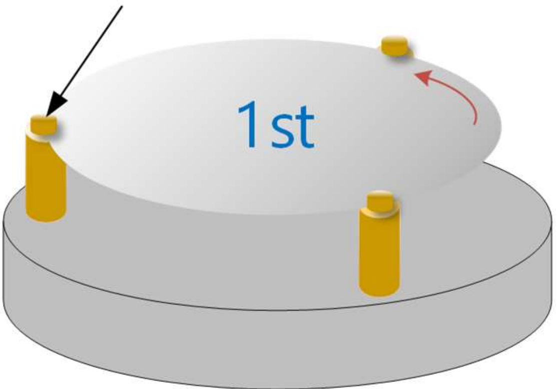
Edge Optics

COMIZOA single step

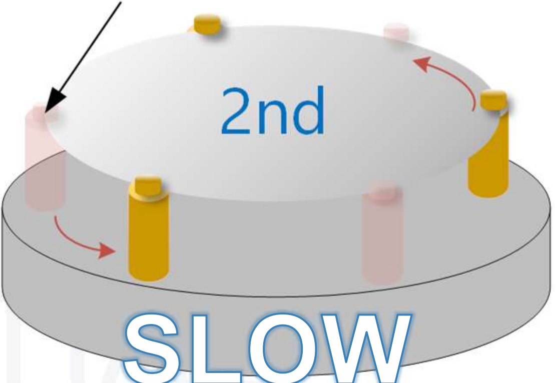


FAST

A company double step



2nd Rotation to inspect these areas



SLOW

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A company

Notch Optics

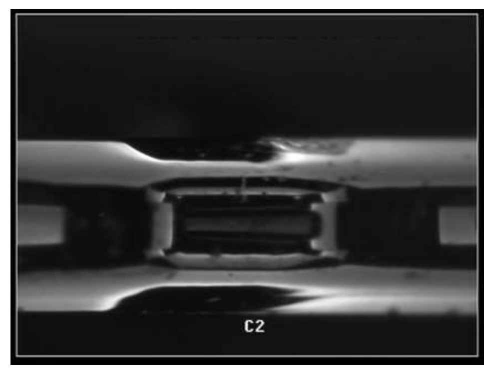
Only One Apex Camera – Area camera

There are no scan cameras for Upper bevel area and Lower bevel area.

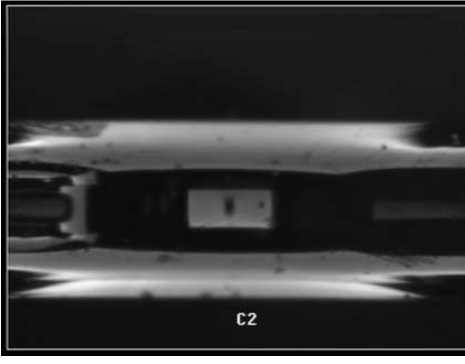
Auto Focusing Function is not supported.

Long time setup and Non-uniform performance between equipment because there is No Calibration wafer.

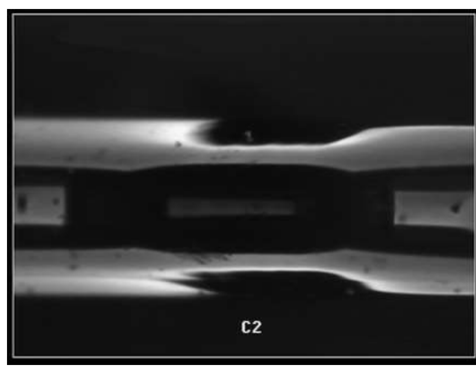
No Upper Bevel Image



Left Shoulder of APEX



APEX Center



Right Shoulder of APEX

No Lower Bevel Image

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Notch Optics

APEX ①

Upper Bevel ②

Lower Bevel ③

Three Notch Cameras are used for Upper bevel, Apex, Lower bevel.

Auto Focusing Function is supported for High quality image acquisition.

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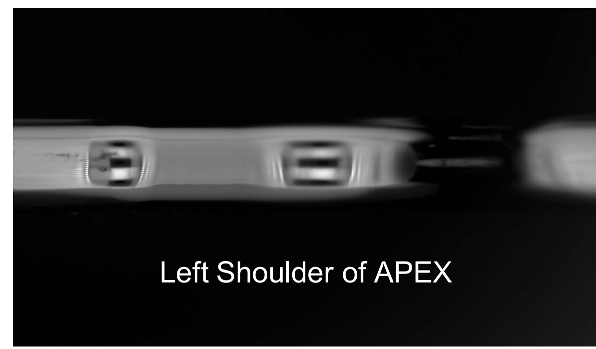
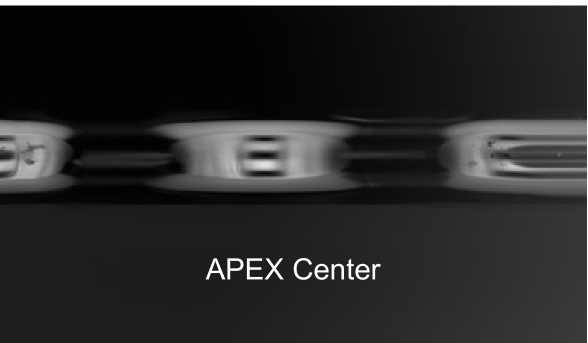
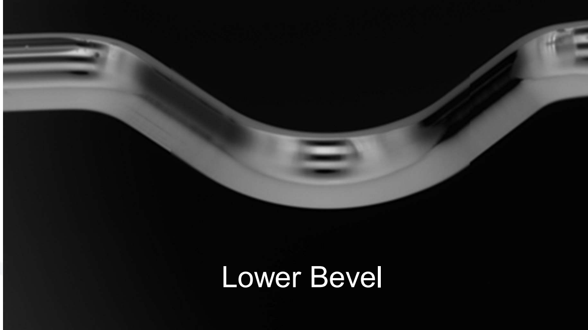
Notch Optics







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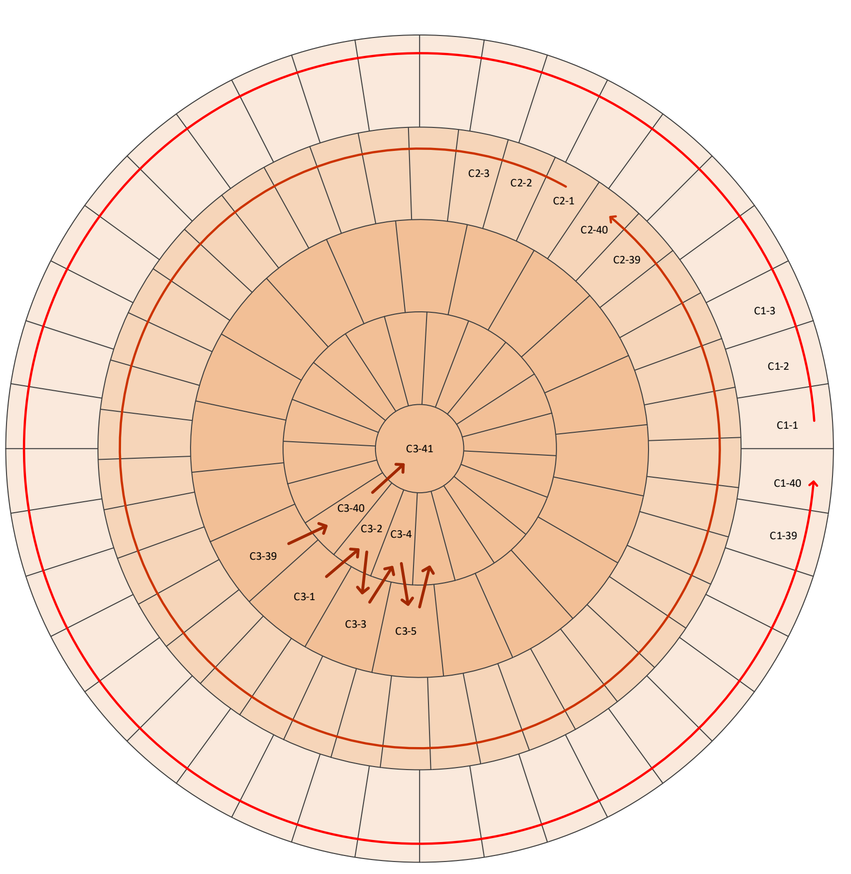
Back & Front side Inspection



3 Area Scan Cameras used.

- FOV : 38.5mm x 29mm

- C1 is fixed, and C2 and C3 can move in a straight line.

- C1 area : The outermost track of wafer (40 shots)
- C2 area : The middle track of wafer (40 shots)
- C3 area : The center of wafer (41 shots)

- Rotates the wafer 9 degrees and shoots per each step,
  a total of 40 images have gathered.

- C3 moves back and forth while shooting 40 shots, and
  finally shoots one shot for the wafer center.

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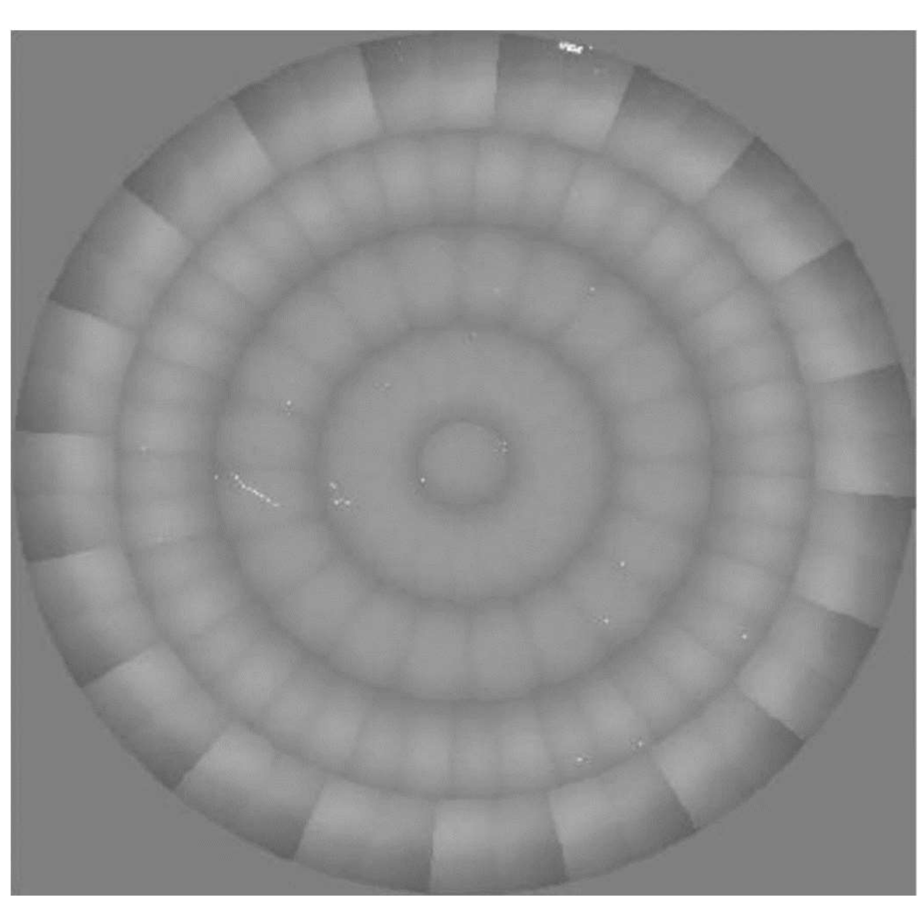
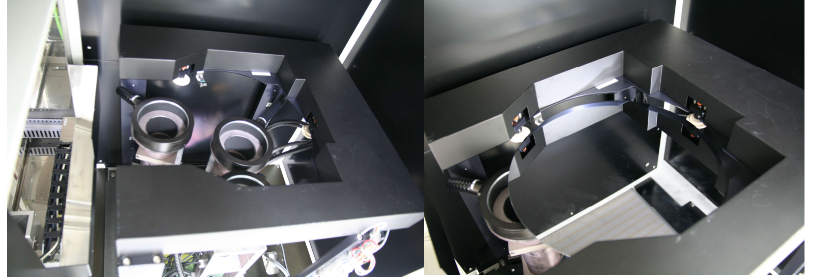
Back & Front side Inspection





The imbalance between the three camera image sensor's Sensitivity.

Image quality deterioration due to overlapping images.

Difficulties in camera setup and maintenance caused by using 3 area scan cameras.

Performance deviation between equipment because there is no calibration wafer.

Risk of Edge damage and contamination caused by using a roller to rotate the wafer.

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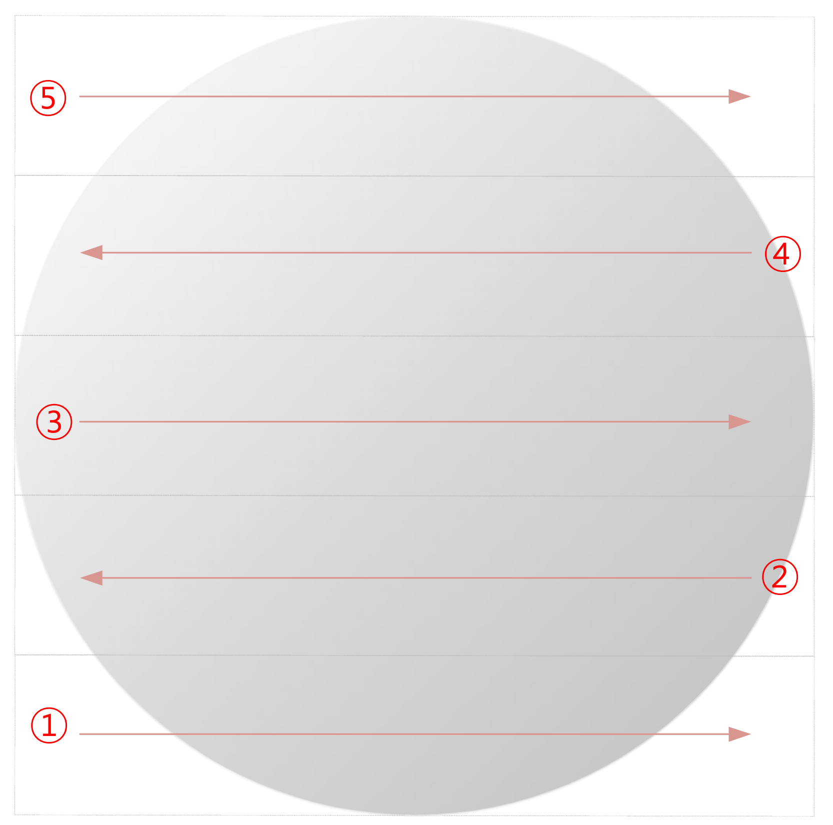
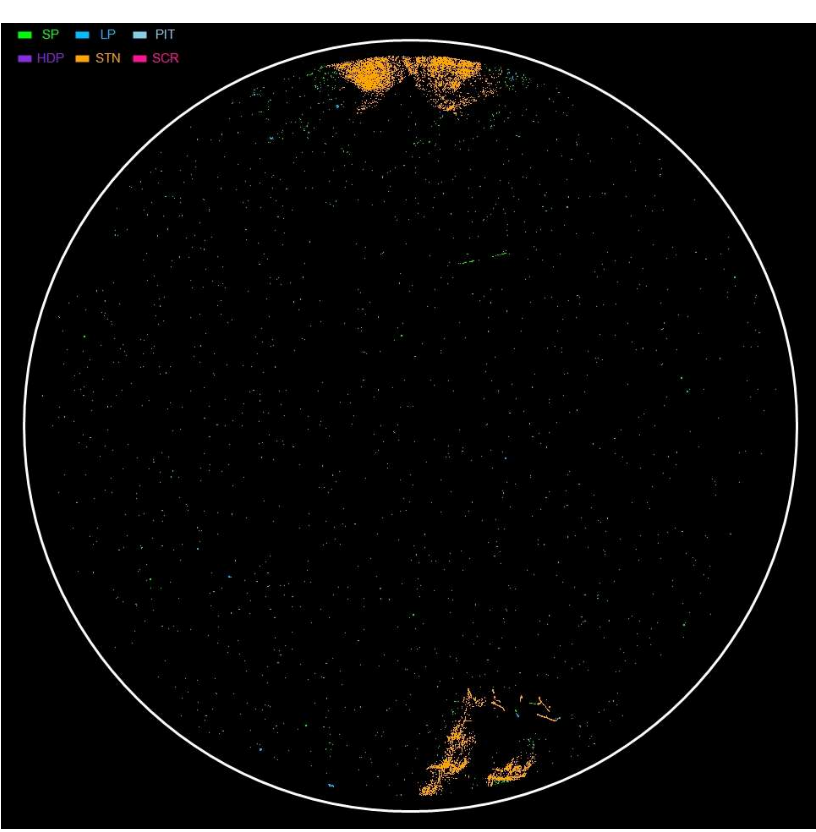
COMIZOA 300mm

Back side Inspection





Use single high-performance line scan camera to improve image quality and high uniformity.

High performance processing and convenient to setup and maintenance.

5 steps for 300mm silicon wafer, 3 steps for 200mm silicon wafer.

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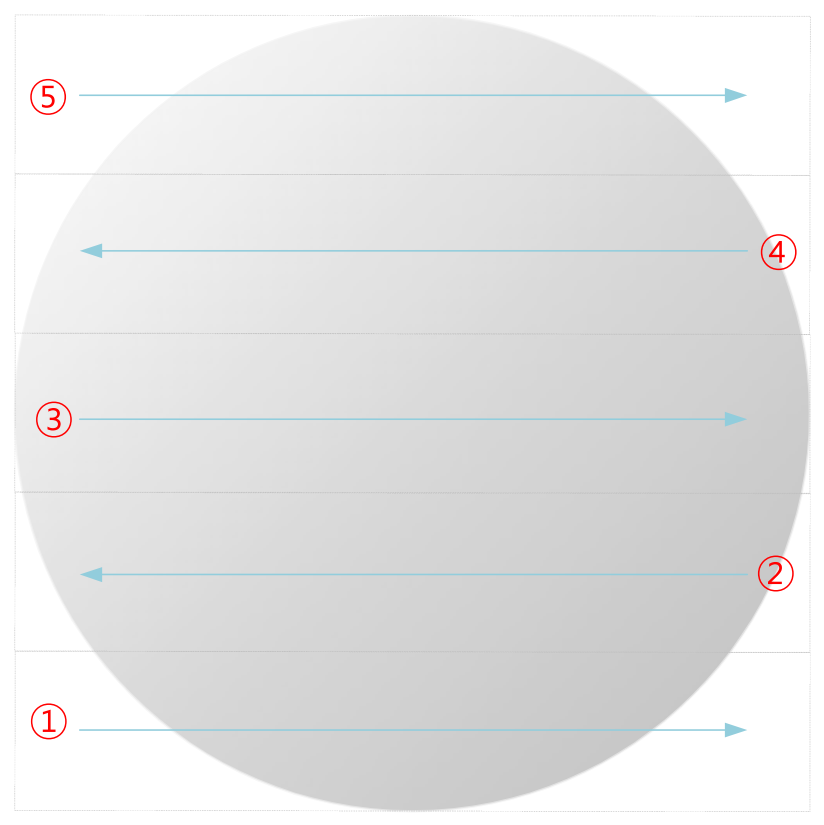
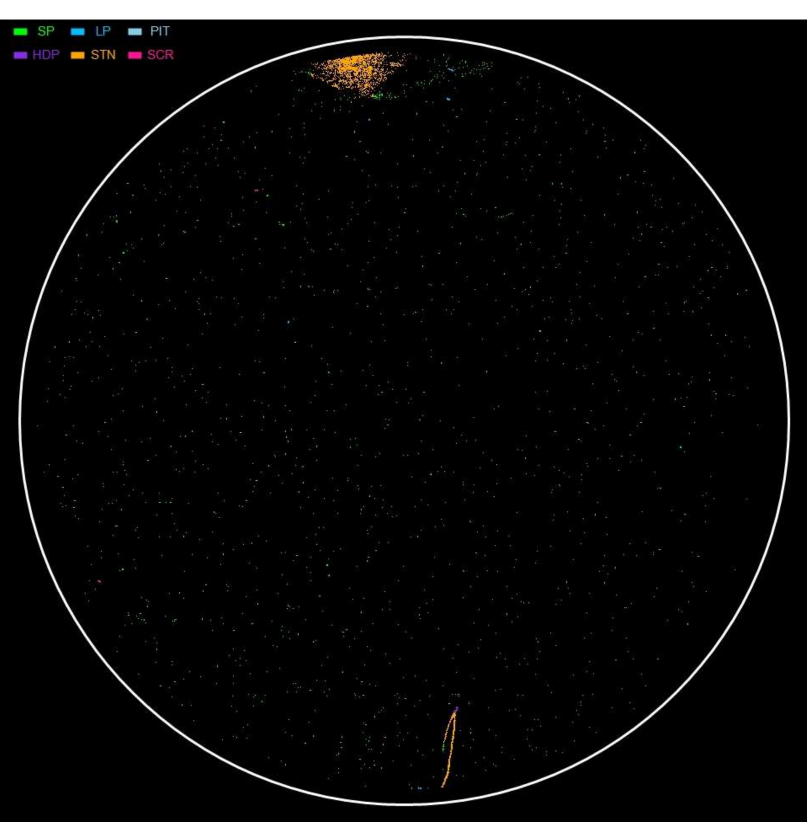
COMIZOA 300mm

Front side Inspection





Use separated two high-performance line scan cameras. (Dark field and Bright Field)

High performance processing through simultaneous D.F and B.F scanning.

5 steps for 300mm silicon wafer, 3 steps for 200mm silicon wafer.

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COMIZOA

Edge Surface Inspection System

Full automated camera and illumination system using modularized camera units and unified illumination unit for each function.

Use the optimized number(4) of High-end industrial computers compared to A company(8).

High speed and High accuracy control are acquired by using customized COMIZOA control system.

High Performance (Throughput) and Advanced Algorithms.

Folding Finger Spider system – Dynamic folding edge grip finger for single turn wafer inspection.

Optimized Equipment Software developed by the manufacturer itself.

Free Calibration wafer in buffer stage.

High reliability and stability.

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Thank you.