

# Automated Optical Inspection for PCMI Applications

PCMI Conference, Verona

Uwe Altmann, KLA

+ + + + + + + + + + + + + + +  
+ + + + + + + + + + + + + + +  
+ + + + + + + + + + + + + + +  
May 19th – 21st 2025

# Agenda

- General information

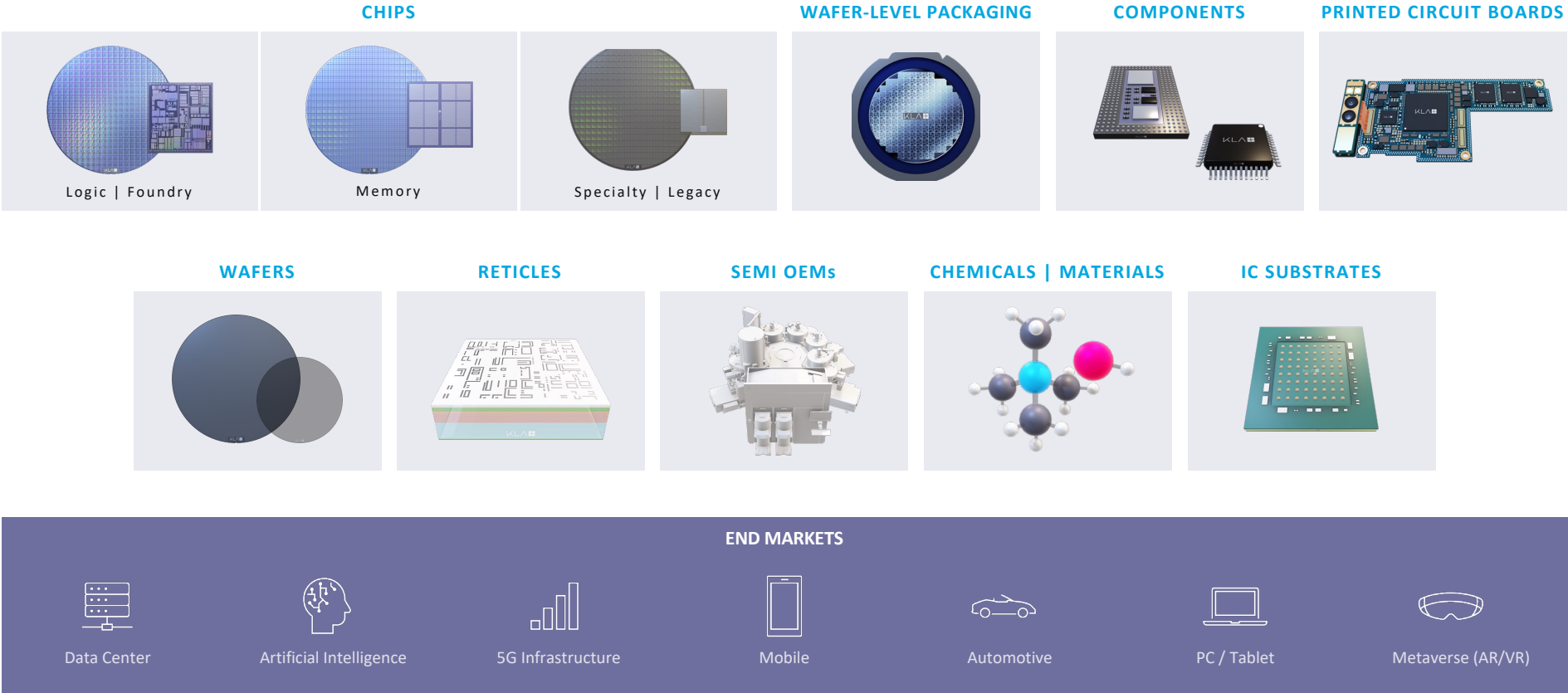
- Who is KLA
- KLA portfolio

- AOI in PCMI?

- Why use AOI
- What to detect
- Main AOI features

- Conclusion

# KLA's Role in the Electronics Ecosystem



# Applications Within the PCMI

- Etching
- Electroforming
- Laser cutting
- 3D printing

# Known Issues

- Dust particles
- Pinholes
- Impurities
- Protrusions
- Dimensions
- Missing items
- Contamination
- Residues
- Nodules
- Handling scratches

## Known Issues

- All these issues can happen at various stages during the production process
- Affected items need to be marked for further inspection
- Some items need to be marked for scrapping

## Facts

- A good, experienced visual inspector can find and eliminate 80% of the flaws in the first working hours but less than 50% after only 4 working hours!
- The eye's ability to find defects decreases over time
- A visual inspector is not able to measure all over the panel: widths, hole diameters and other critical dimensions
- **THE HUMAN VISUAL INSPECTION IS LIMITED!**

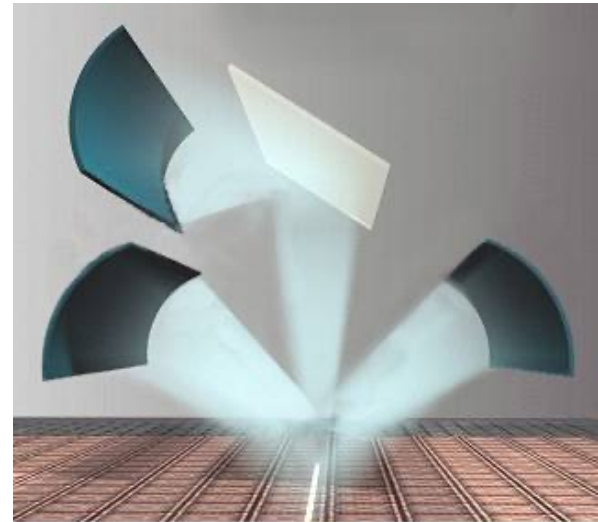
# Multi Image Technology™





## Automated Image Acquisition in the Beginning....

- OMNI white light coverage
  - Wide angular coverage
  - Different angles for different applications
- Custom made CCD
- Custom filters



# Multi-Image Technology™

## Revolutionary results in panel inspection

- KLA's AOI systems inspect each panel multiple times in one scan under different lights and from different angles
- **The result** – revealing details unseen before



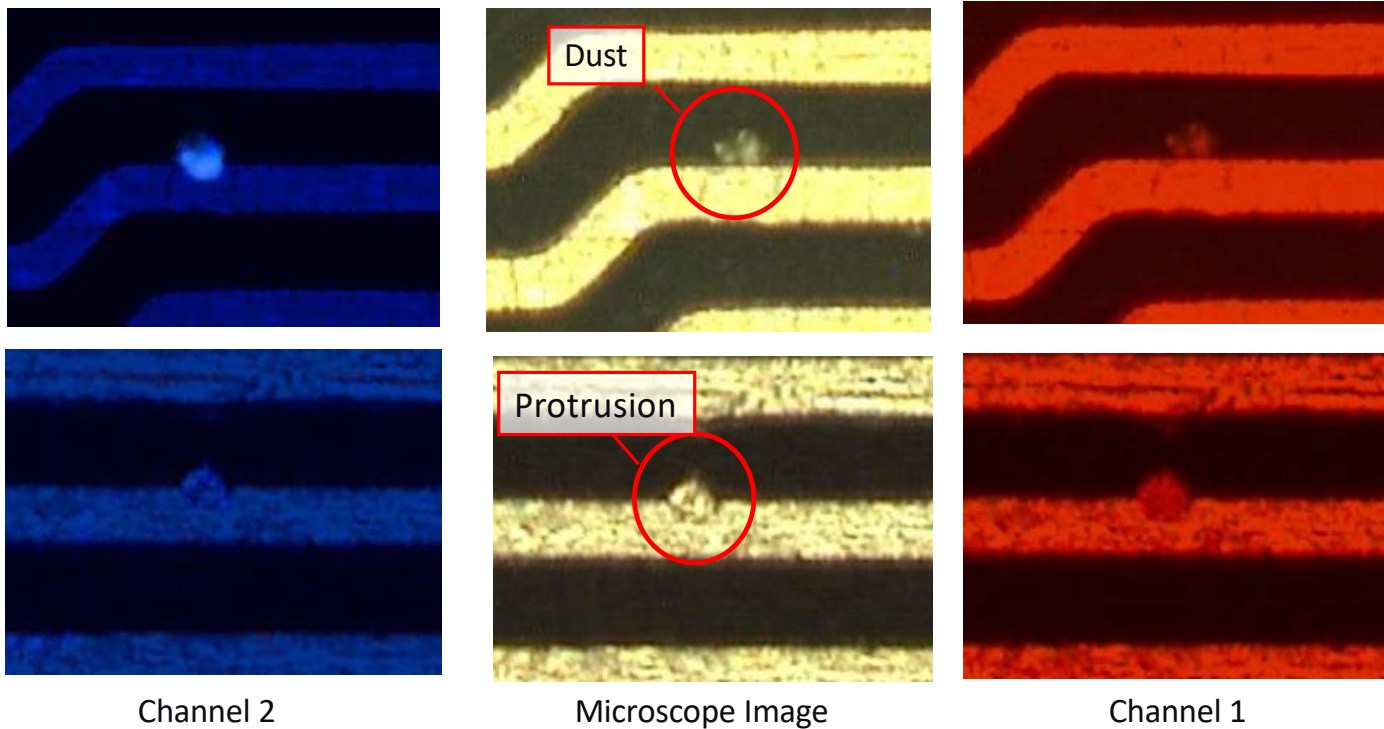
Different light angles



Different wavelengths

# Multi-Image Technology™

Is it a protrusion defect or simply dust?

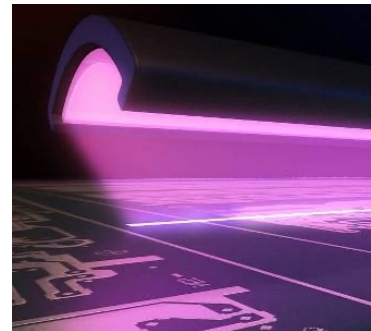


## Multi-Image Technology™ Continued...

### **Triple Vision Technology™** **Superior Performance in Any Aspect**



- Automatic selection of 3 parallel channels of inspection
- 3 Images contain:
  - Wavelength
  - Light intensity
  - Light angles
  - Binarization
  - Streamlined setup



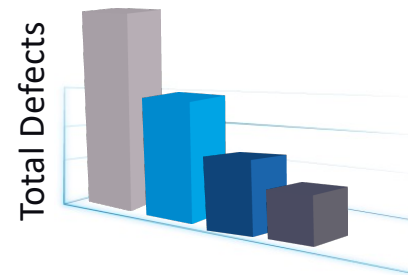
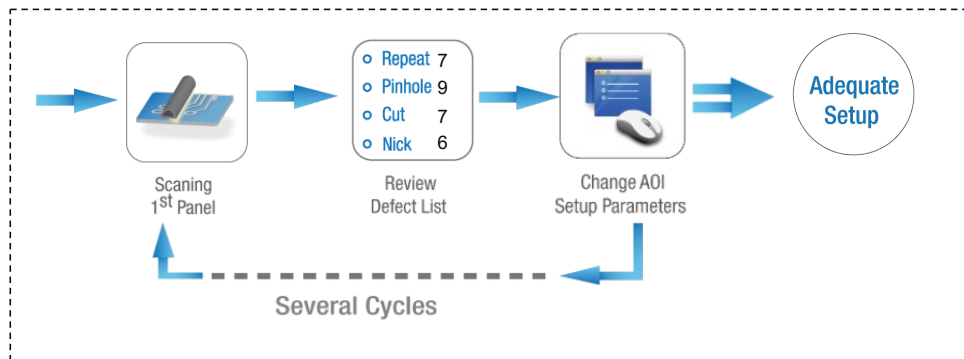
# Smart Setup™



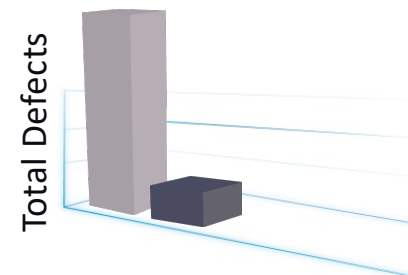
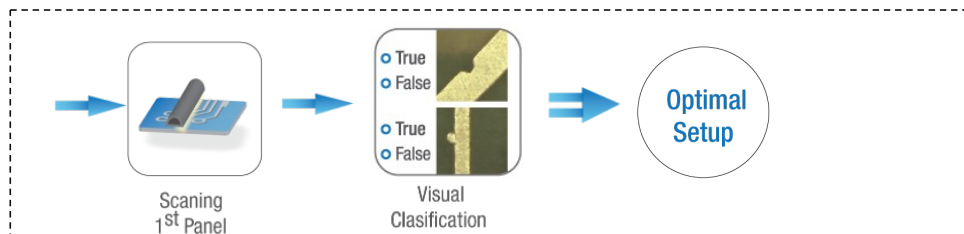
# Smart Setup™

## Intuitive, Short and Optimal

### Traditional AOI



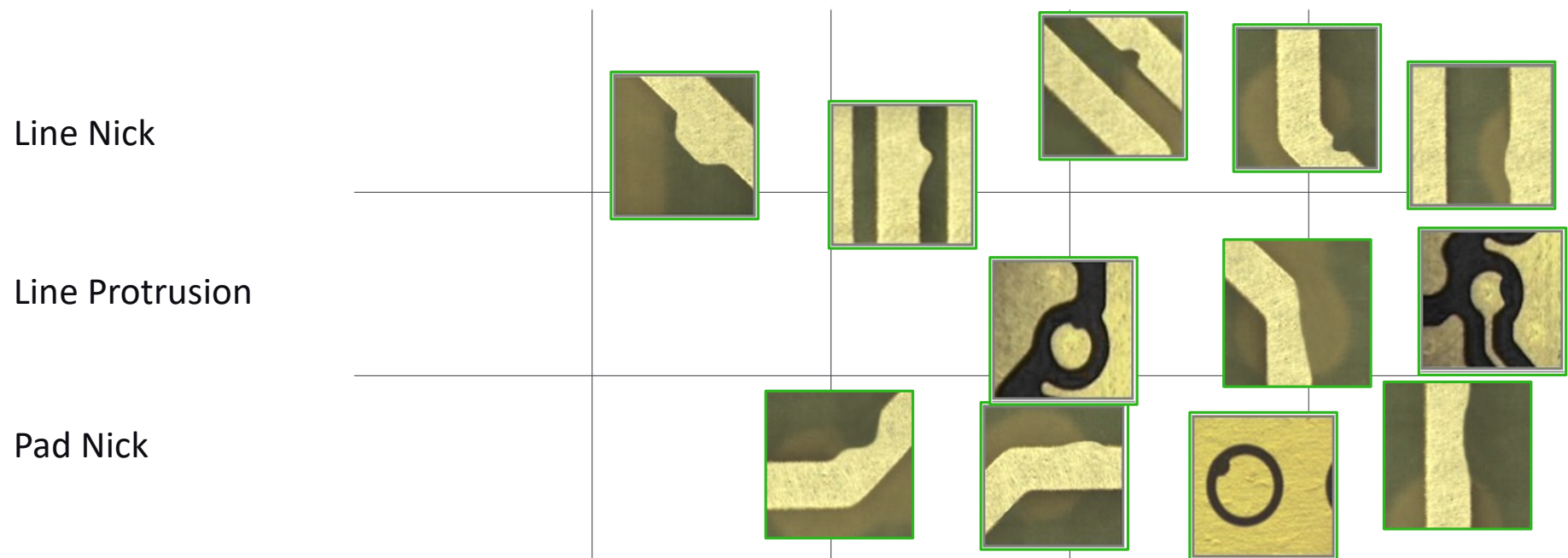
### Smart Setup



# Smart Setup™

## Stage I – automatic defect grouping








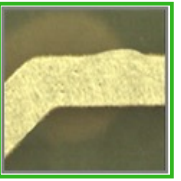
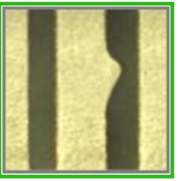



- Using panel understanding, Smart Setup automatically groups defects per type



# Smart Setup™

## Stage II – automatic defect grouping

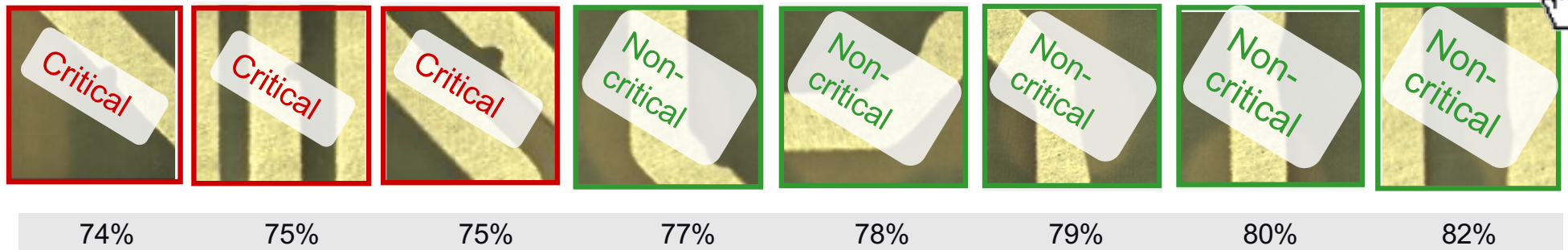
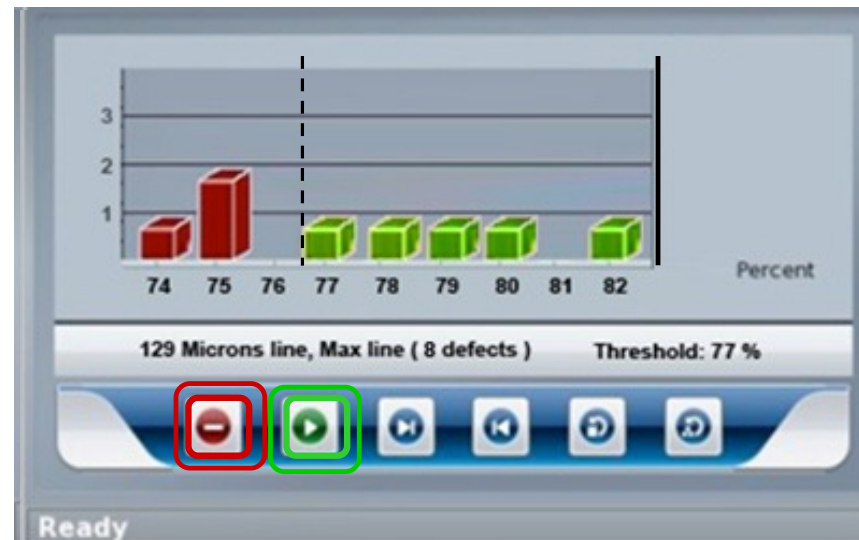
- For each group, Smart Setup automatically sorts the defects according to severity, from the most critical defect, to the least one

|                 |   |  |   |  |   |
|-----------------|---|--|---|--|---|
| Line Nick       |  <div>Critical</div> |    |    |   |  <div>Non-critical</div> |
| Line Protrusion |                     |   |   |  |   |
| Pad Nick        |                    |  |  |  |   |



# Smart Setup™

## Stage III – visual classification



## Defects to be Detected by AOI

- Dust particles 
- Pinholes 
- Impurities 
- Protrusions 
- Dimensions 
- Missing items 
- Contamination 
- Residues 
- Nodules 
- Handling scratches 

# Conclusion



Where the Human  
Eye Stops...



...Automated Optical  
Inspection Begins

# Thank You!

