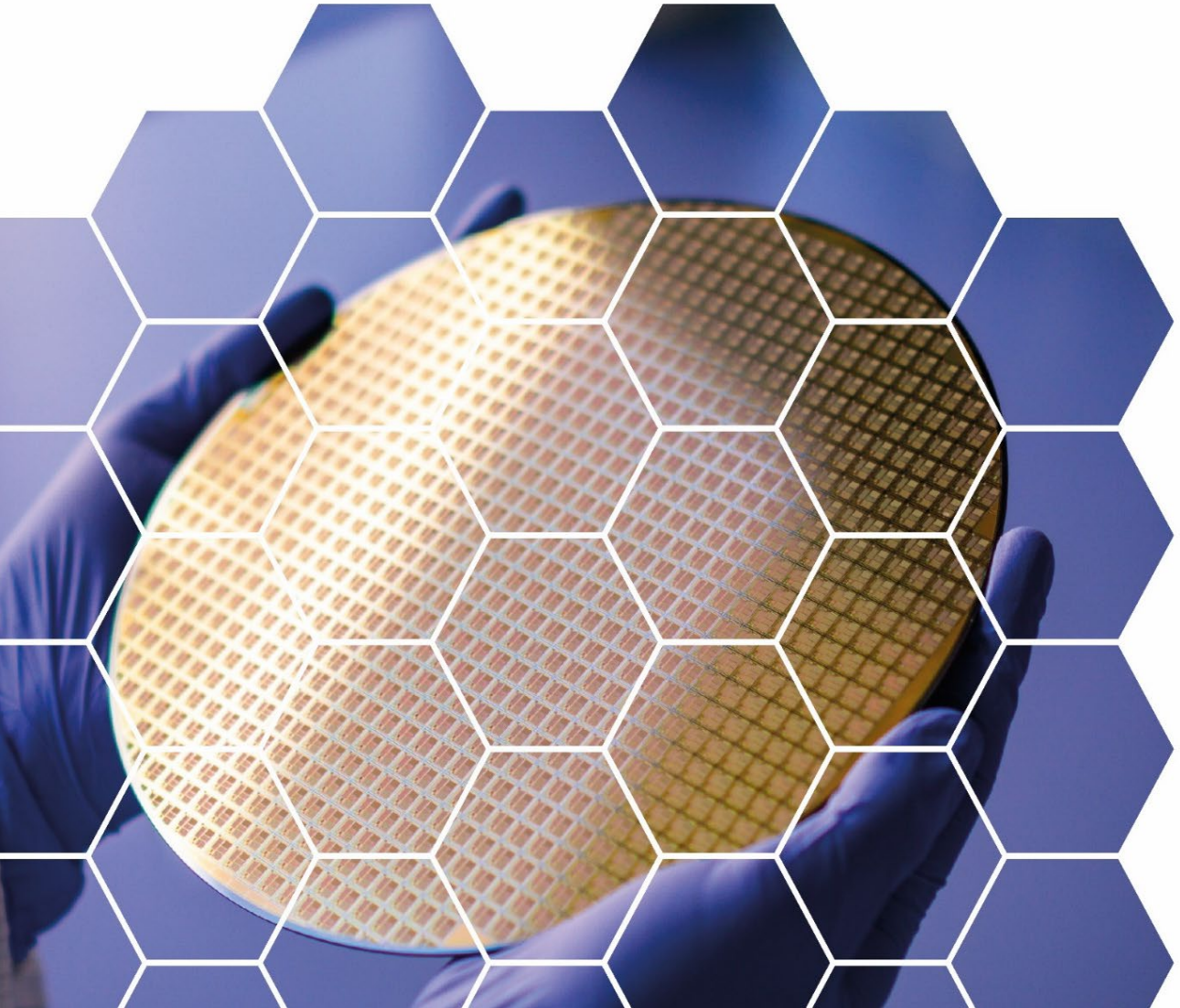


RoodMicrotec

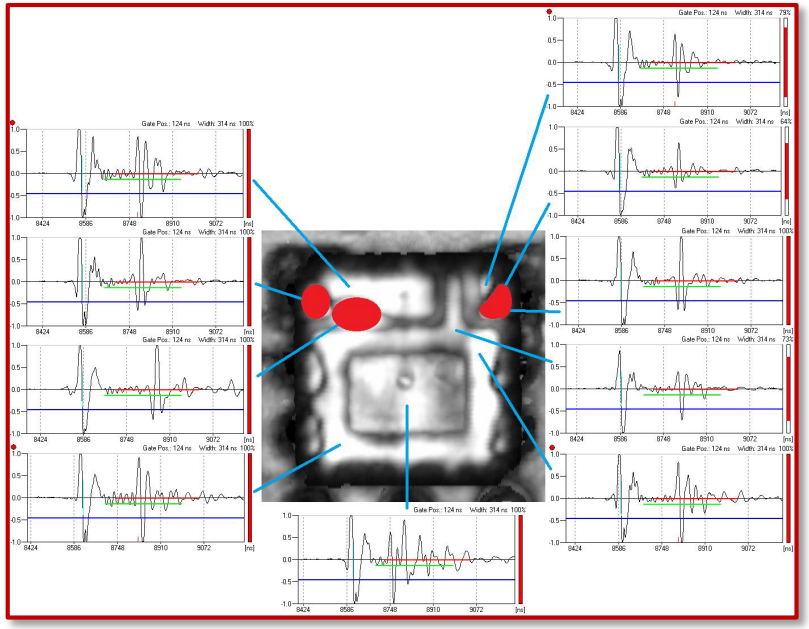
Scanning Acoustic Microscopy (SAM)

Dr. Stefan Borik

January 2022

SAM

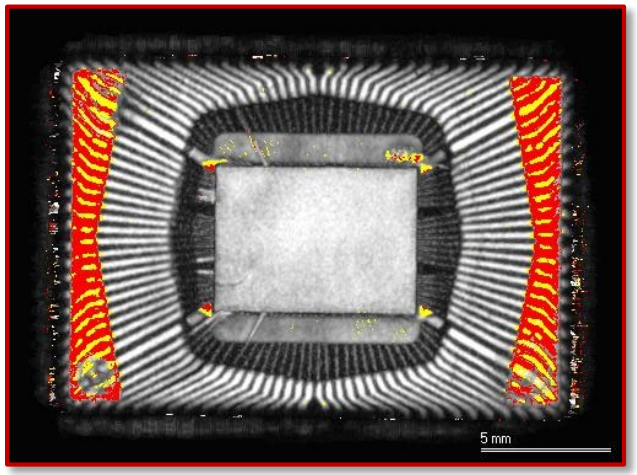
- Subject …
  - Molded Integrated Circuits
  - Adhesion of interfaces
  - Voids in solder or adhesive material

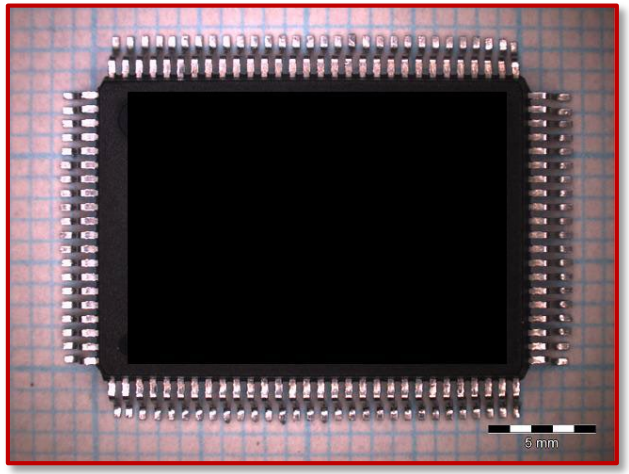


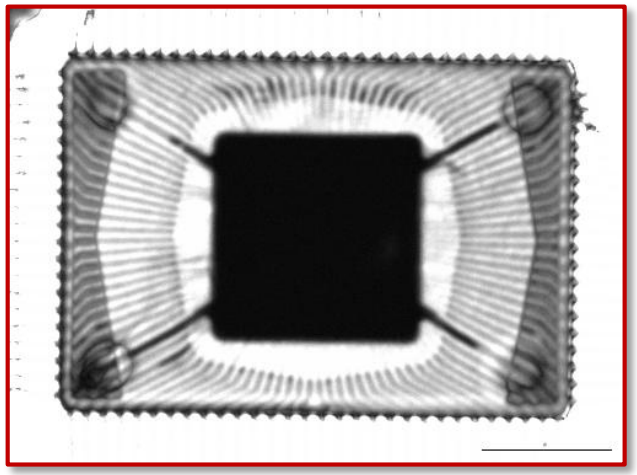
- Purpose …
  - Qualification acc. to AEC-Q and other standards
  - Moisture Sensitivity Level (MSL) classification
  - Failure Analysis
  - Customer’s requirement

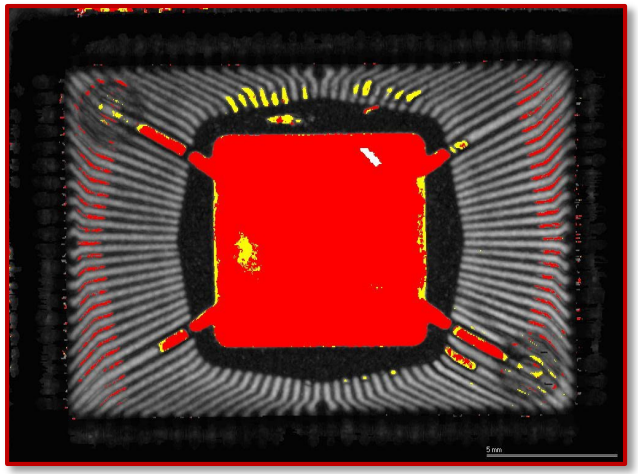
CSAM standard

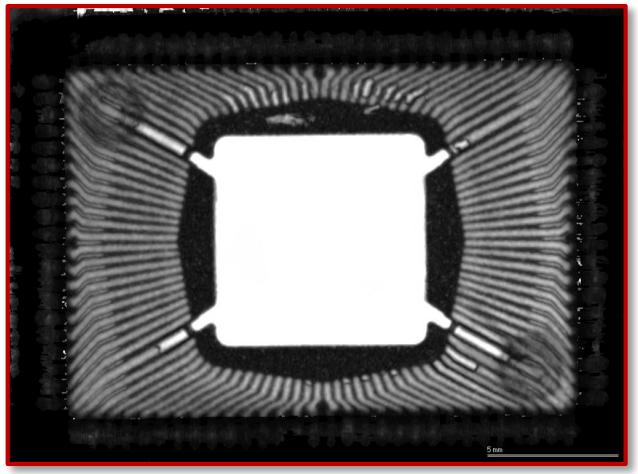
- Standard pictures: echo grey & red and transmission





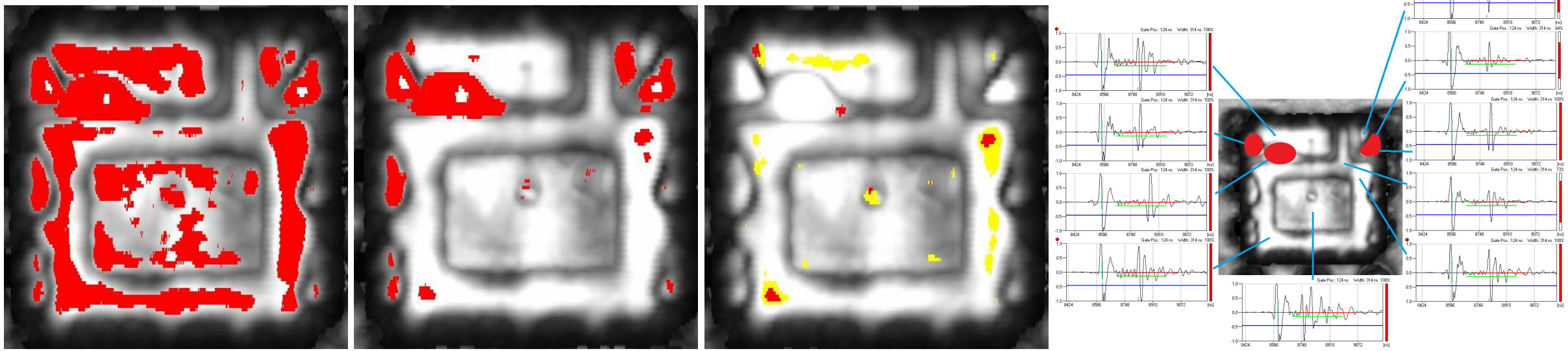






Methods to display SAM pictures

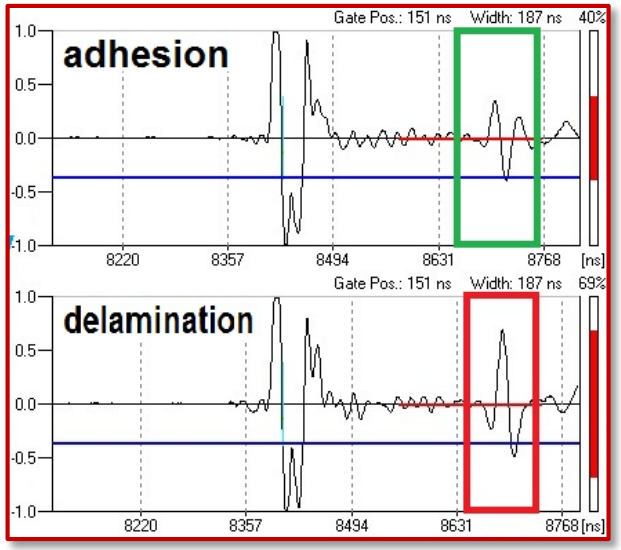
- How to interpretate SAM pictures correctly - Grey vs. Red
  - Decide by A-scan
  - Effect of threshold values on colorizing
  - Correct assessment needs experience

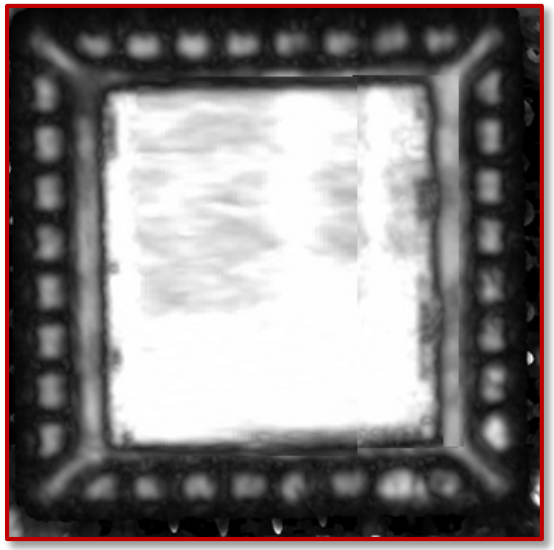


Choose the threshold? Interpretate the A-scans? That's our job!

Presentation of results: CSAM and delamination map

- Reduction of data and focusing on the relevant information
  - Full detail information: A-scans
  - Integration of signal vs. time results in C-scan
  - Evaluation by operator presented as delamination map
  - Automatic counting in calculation program indicates pass / fail binning



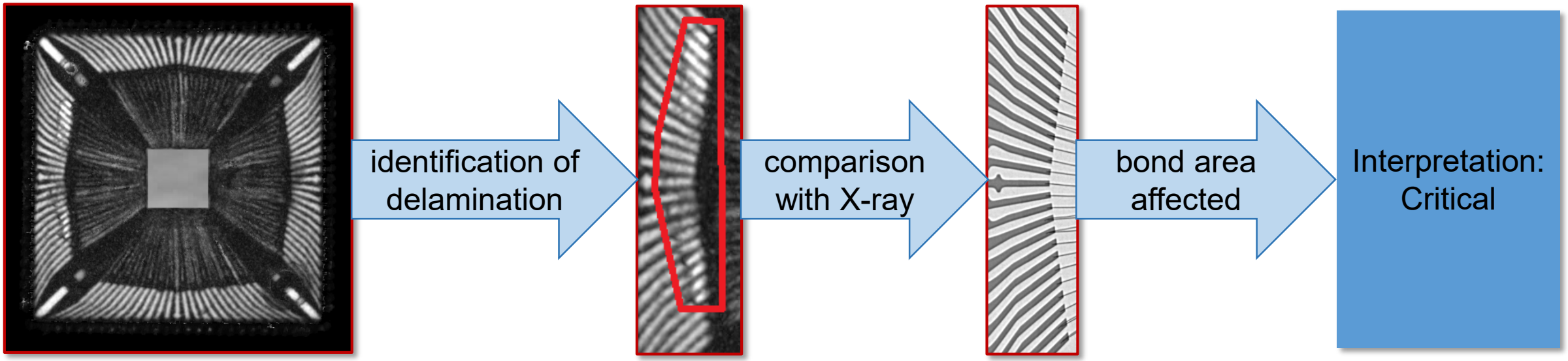


●	32	31	30	29	28	27	26	25	
1									24
2									23
3			die-paddle						22
4			x						21
5									20
6									19
7									d
8									d
	9	10	11	12	d	14	d	d	

		number of pins		
Lot	SN	ok	delami-nation	result
A	1	27	5	fail
	2	32	0	pass
	3	32	0	pass
	4	32	0	pass

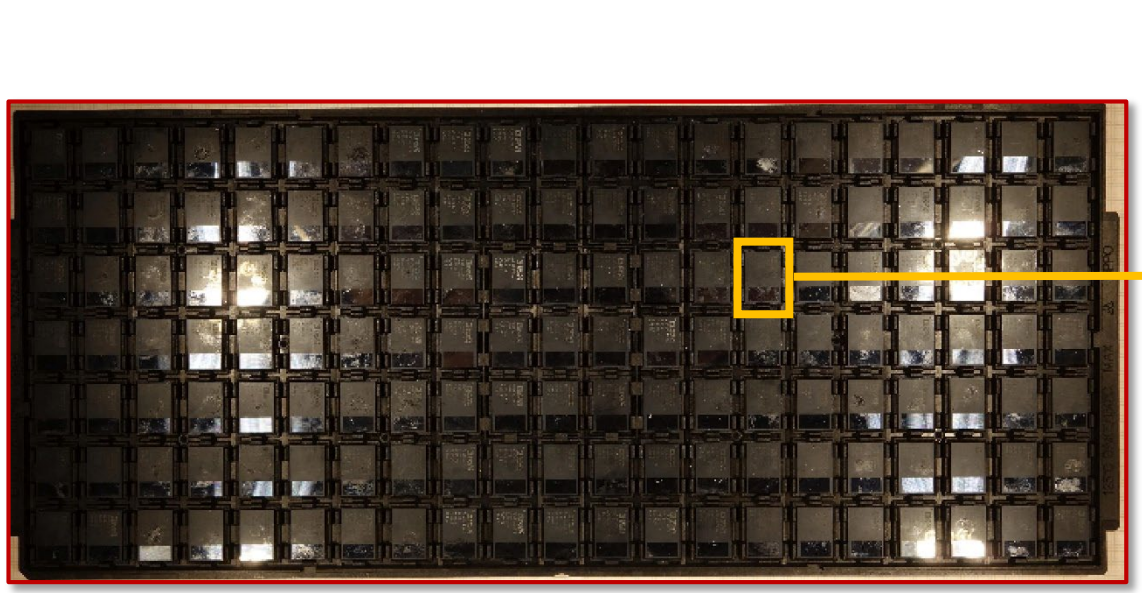
From CSAM to assessment

- CSAM and X-ray
  - 1st step: measurement
  - 2nd step: display of result
  - 3rd step: interpretation of result
  - 4th step: conclusion and actions at customer's site

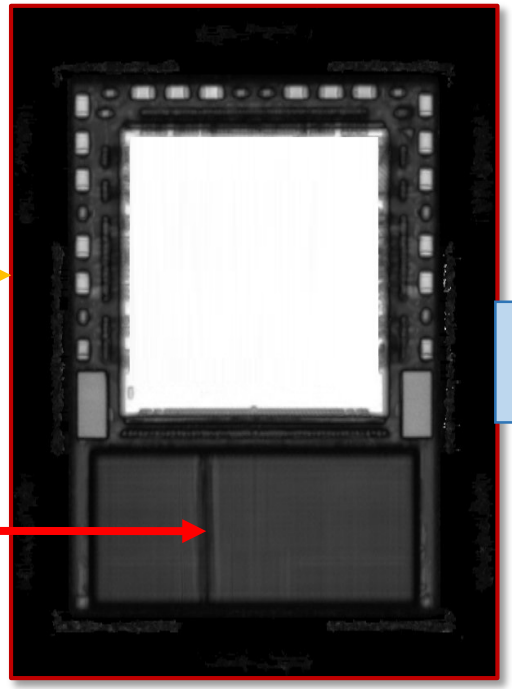


Screening of entire trays for chip-cracks

- Devices in trays: even thousands can be screened
  - Incoming inspection as delivery or lot check
  - Verify “zero fail”
  - Process and deliver only good devices to your customer



crack in chip found

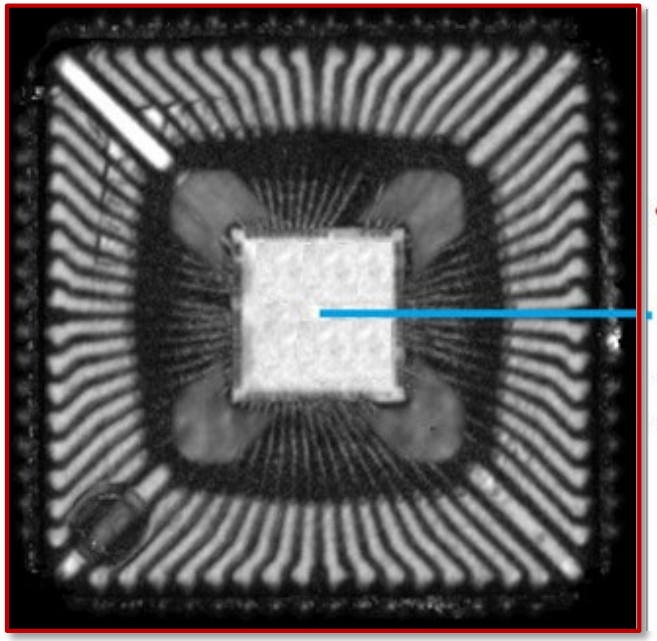


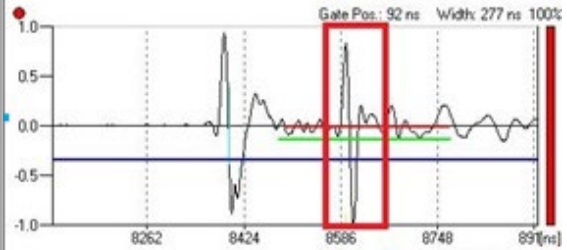
decision

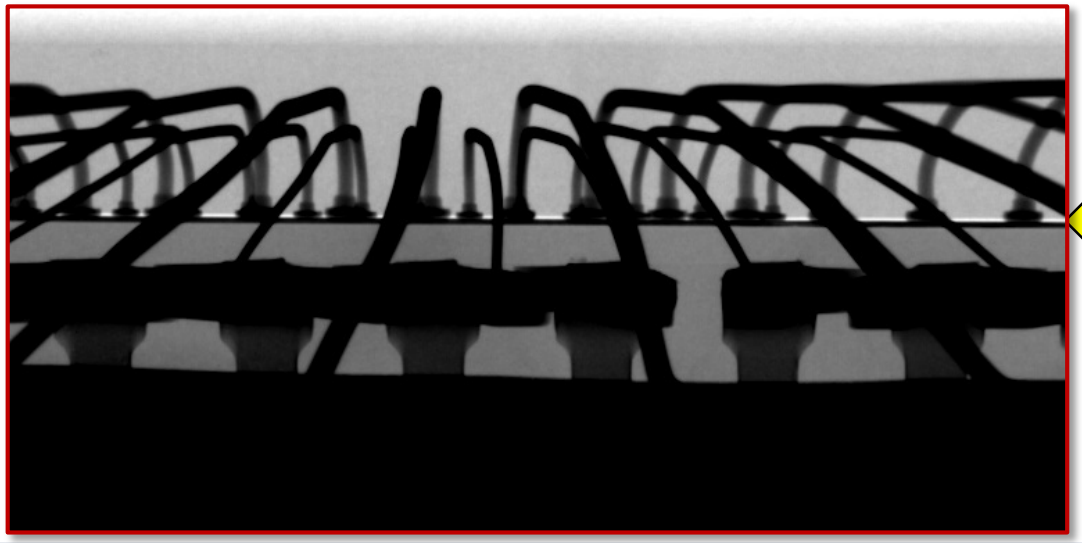
Reject lot with fails OR Provide only pass devices

Delamination or polyimide?

- Delamination? No, just polyimide on chip surface!



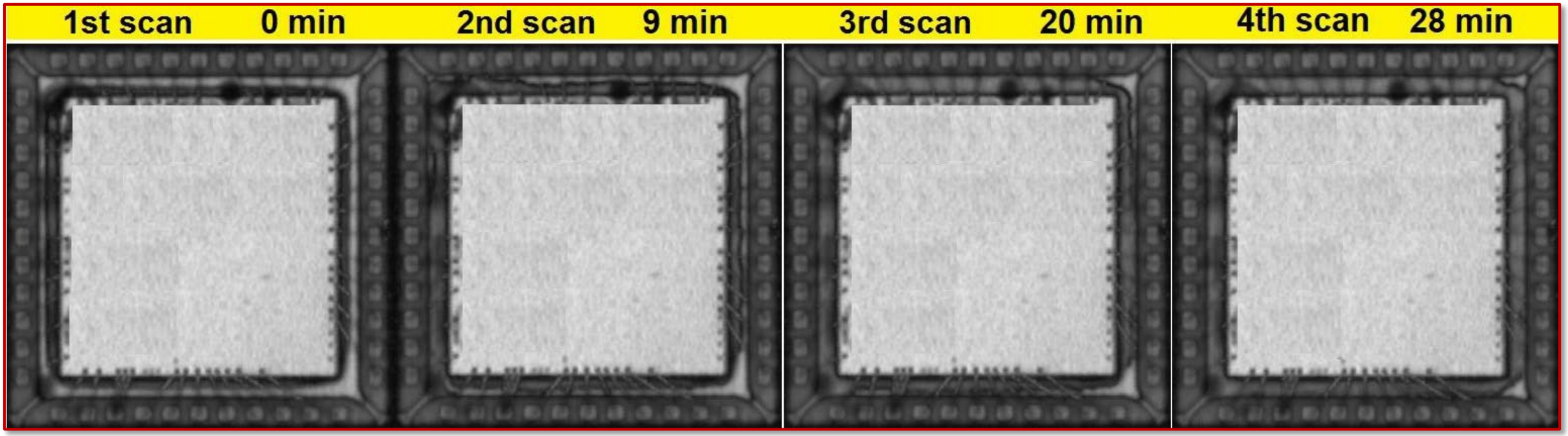




X-ray shows transparent material on top of chip

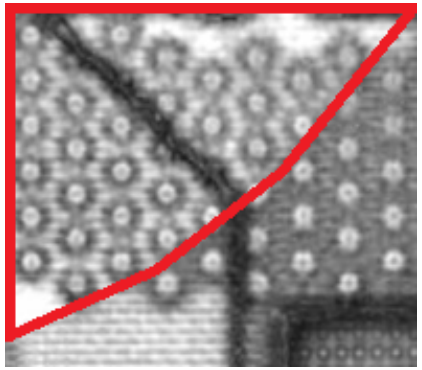
Dynamic effects

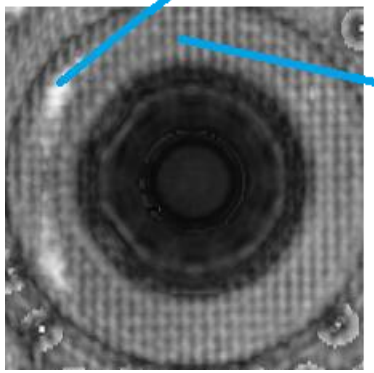
- Water penetrates device during test
  - What shall we do with the drunken device?
  - Delamination vanishes due to filling of the gap by water

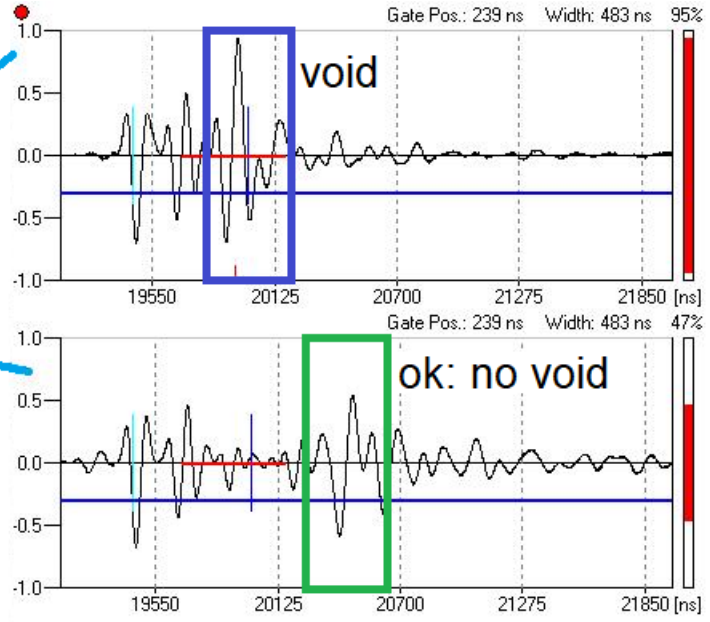


Investigation of PCBs

- Glass fibers in PCBs scatter the ultrasonic sound and reduce accessibility
  - Delamination (red encircled) within PCB can be detectable, but not in all cases
  - Voids (bright spots)

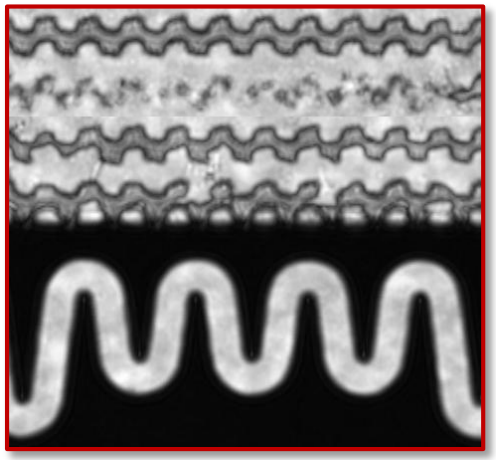






Investigation on Heat Exchangers

- Production properties
  - Quality of soldered inlay parts
  - Voids in bulk or solder



Key features

- Accreditation
  - ESA/SCC 25200 Issue 2, October 2013
  - JEDEC J-STD-035:1999
  - MIL-STD-883 method 2030.2
- Echo mode
- Transmission mode
- Transducer frequencies from 10 to 150 MHz
- Scan range : 321 mm x 256 mm
- Basin size : 600 mm x 570 mm x 60 mm

➢Highest quality for our customers!

Summary

- Scanning Acoustic Microscopy is a valuable non-destructive method
- Detection of delaminations, cracks and voids
- Your benefits at RoodMicrotec:
  - High quality equipment of leading manufacturer PVATePla
  - Experience of operators
  - Creativity of Operators: if necessary immediate use of additional methods
  - Presentation of results
  - Knowledge to assess the results
  - Fulfilling customer‘s quality and documentation requirements

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Partner
in Business!

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