

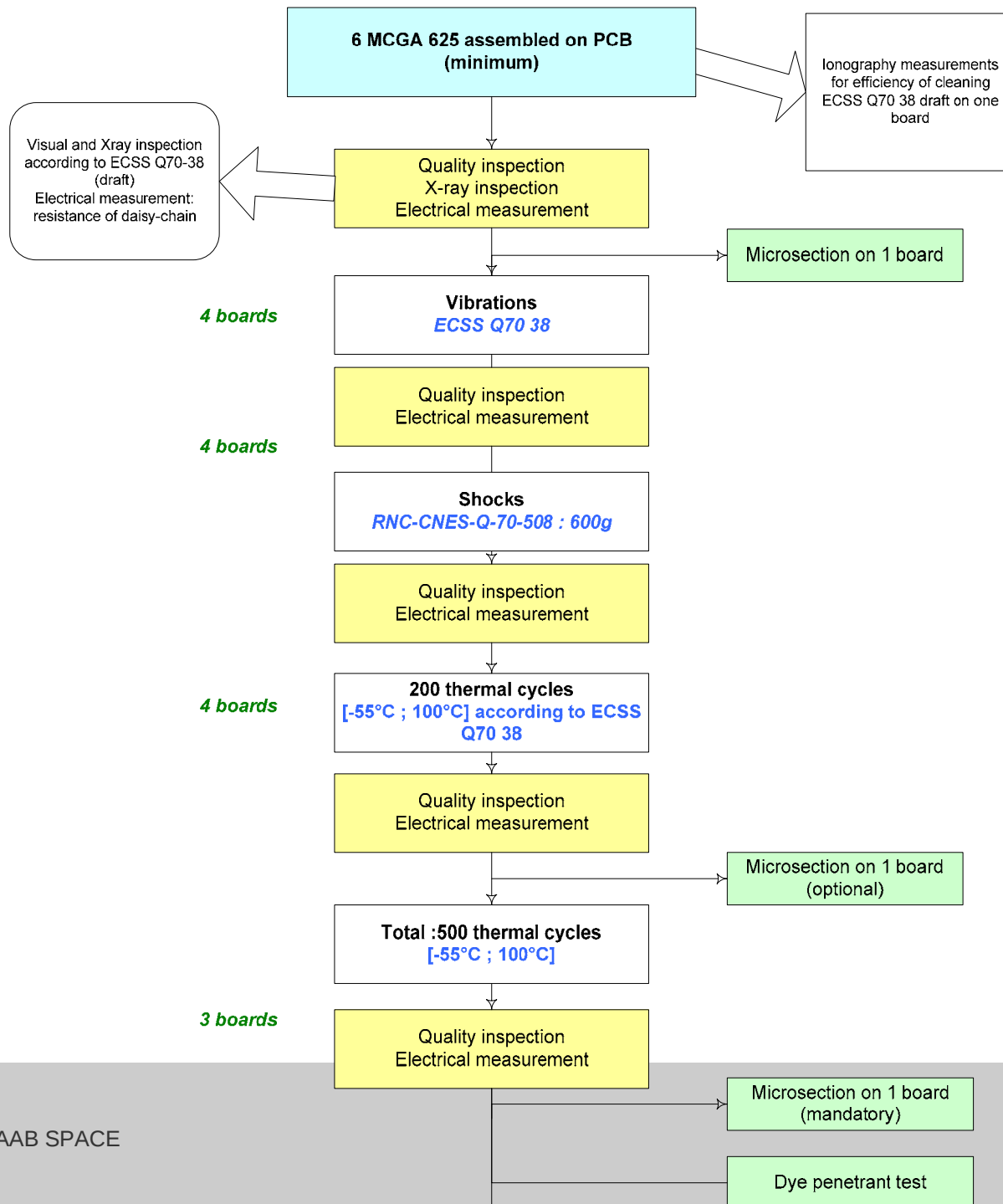
Atmel CGA 625 Mounting Evaluation

Saab Space



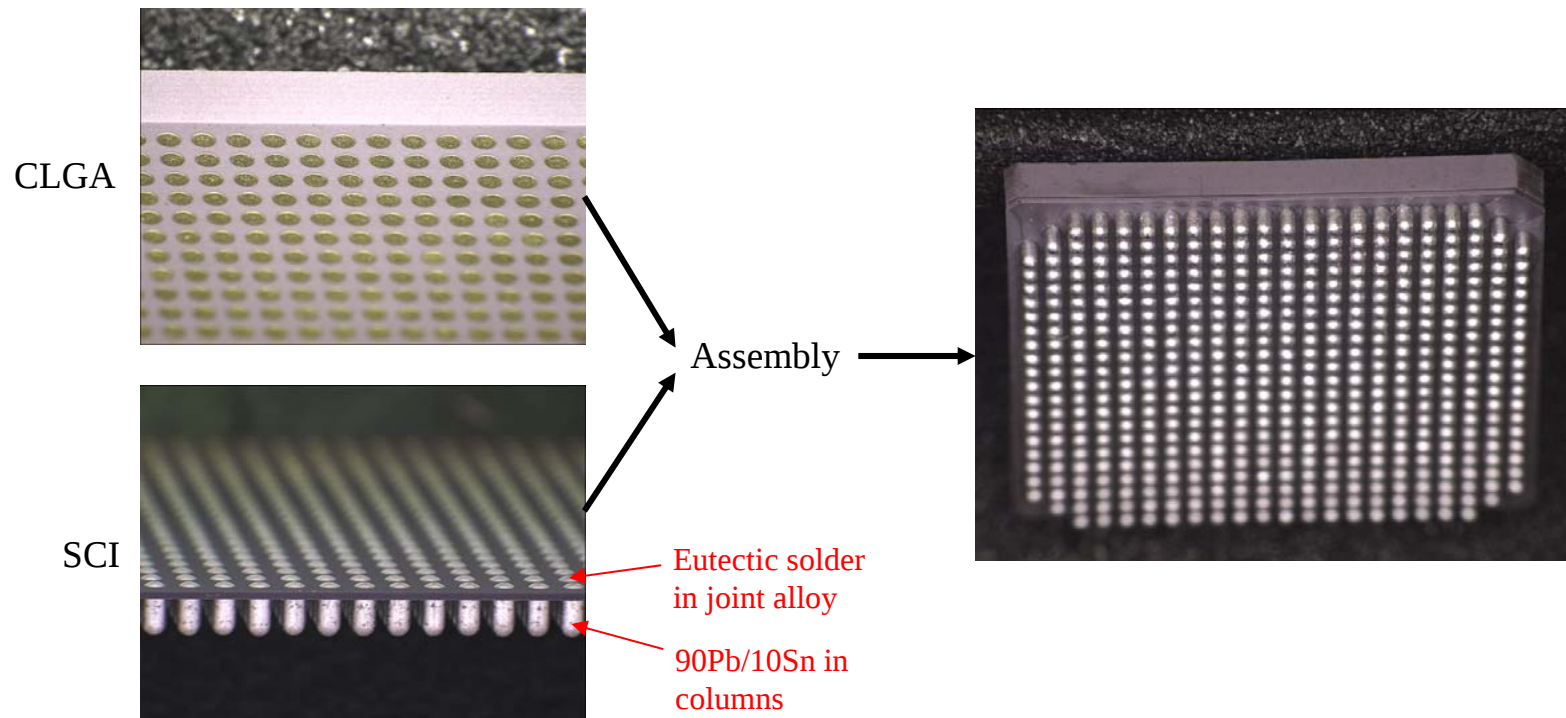
Stanley Mattsson

Estec, May 22nd, 2007



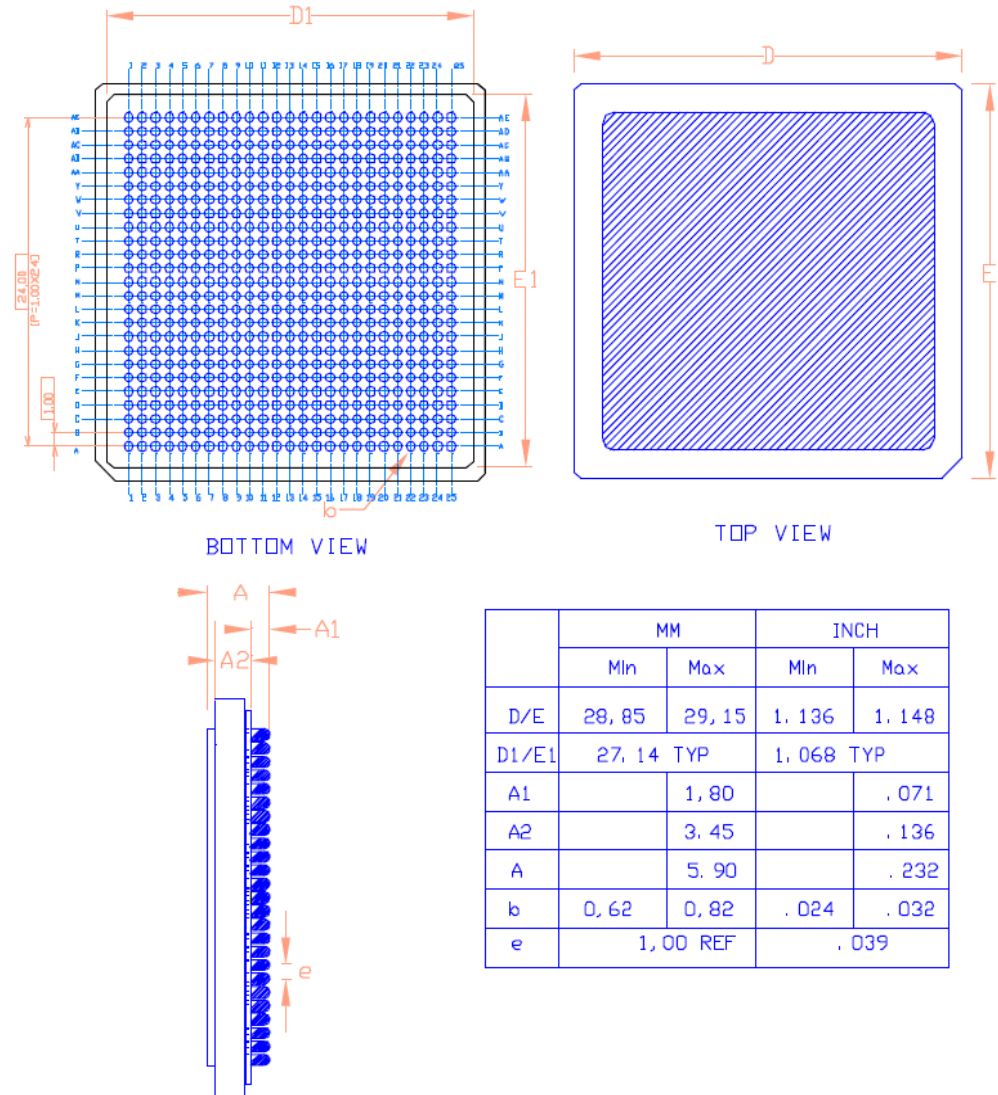
Package Assembly

- Mounting verification of NTK 625 CLGA Package from Atmel
 - Atmel (e2v in Grenoble) mounted Solder Column Interposer on Ceramic Land Grid Array
 - ✓ Eutectic solder on flash Au, Alpha SLS65 flux and no cleaning



Package Drawing

- ❑ Column Pitch = 1 mm
- ❑ Column width 0.62 – 0.82 mm
- ❑ co-planarity ? μm



Production Processes

- ☐ Screen printing ,
- ☐ Pick&Place,
- ☐ Reflow Soldering
- ☐ Repair - hot air rework station
 - Dispensing solder paste
 - Pre-Heating complete board before replacement
 - Optimize thermal profile rigorously



Qualification programme

□ Environmental tests

- Shock, 600g 3 axis
- Vibration, sinusoidal and random
- Thermal cycling, 500 cycles according to ECSS-Q-70-08A, §13.2

□ Analysis methods

- Electrical monitoring during environmental testing using Daisy Chain
- Visual Inspection
- X-ray inspection using 2D-5 axes microfocus equipment
- Micro sectioning
- Dye penetrant and pull test

Test Boards

- ❑ 4 test boards, A1 – A4,
 - 18-layer glass reinforced polyimide, thickness $2,9 \pm 0,3$ mm
 - Board dimension 160,0 x 233,4, manufactured by Printca
 - Circular pads and tear-drop pads with Ø31 mil and via-in-pad design
 - Plating minimum 10 µm Sn63/Pb37 hot oil reflowed solder

Matrix showing environmental tests etc subjected to each board. The light grey colour indicates the board submitted to repair.

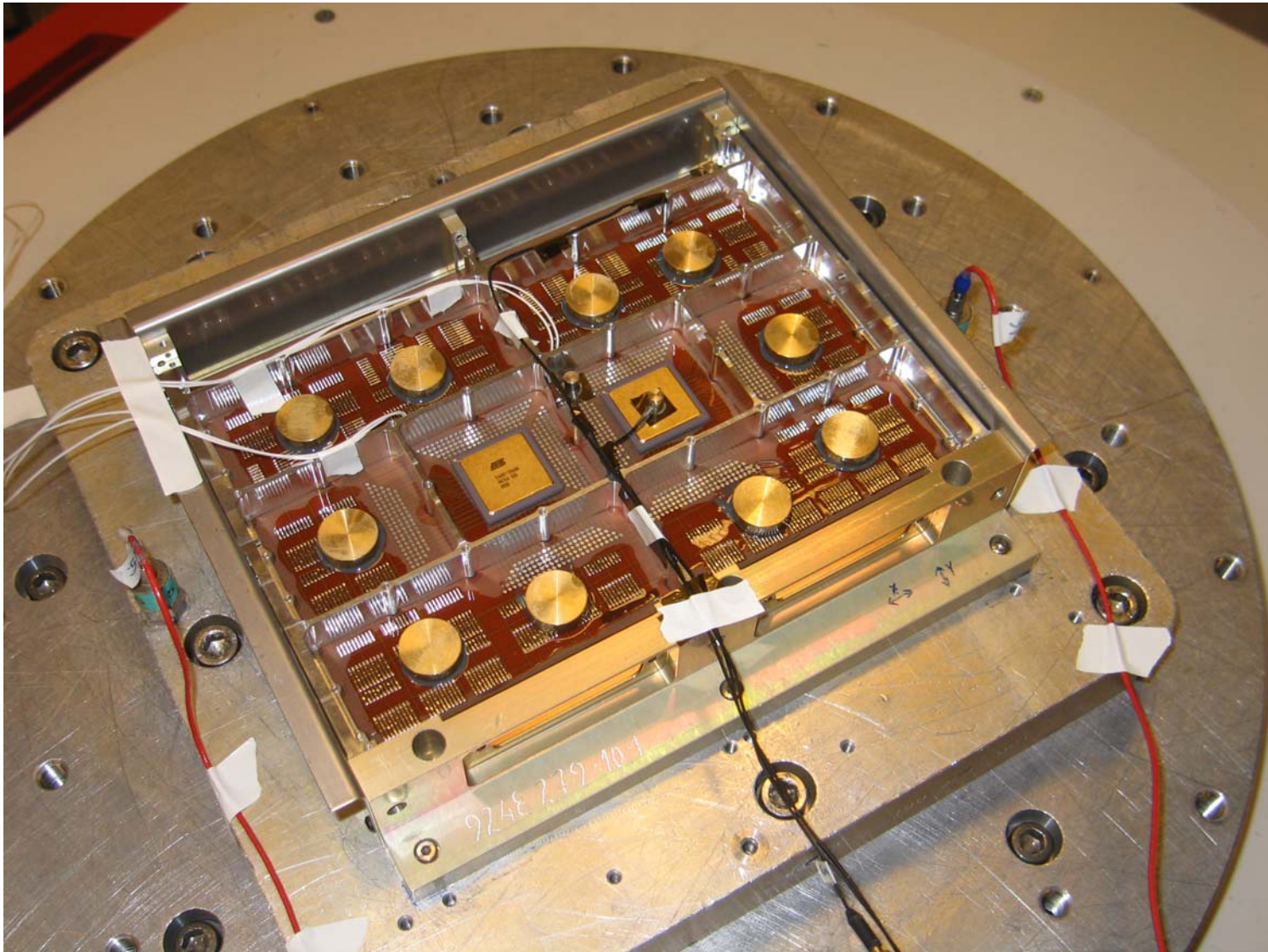
* If needed, extended micro sectioning can be performed

** Dye penetrant test after 200 thermal cycles

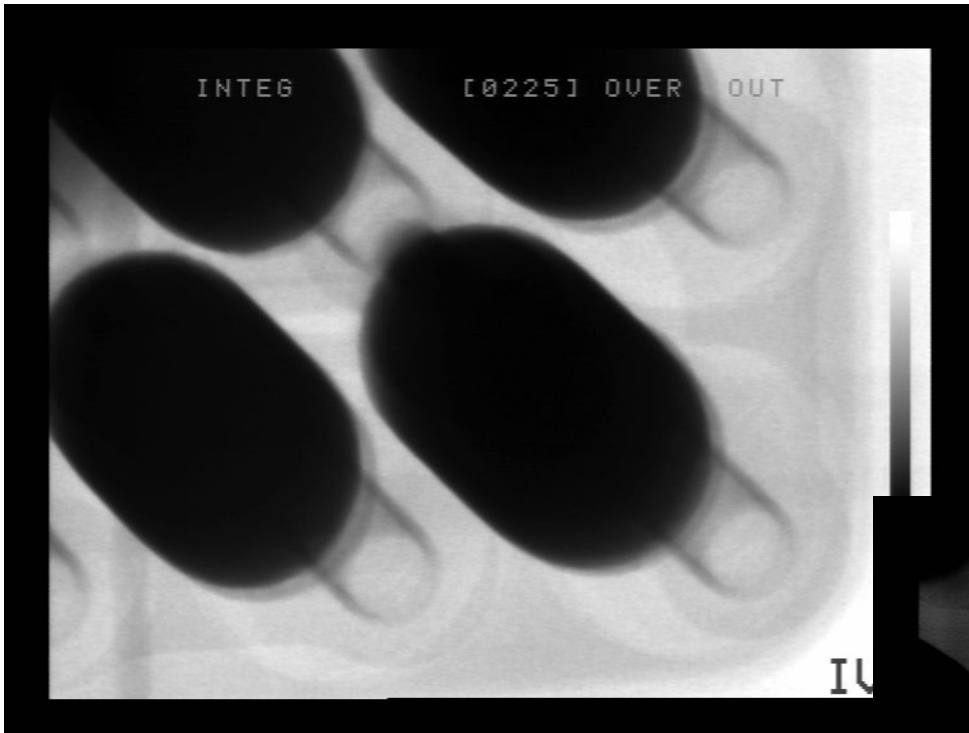
*** 600g shock test

Board
submitted
to repair.

PCB/Work order	No. of MCGA62 5	Environmental tests						
		Random vibration §9.1	Sinus Vibration §9.1.2	Shock §9.2	Thermal Cycling §9.3	Micro sectioning	Dye Penetrant Test	
A1 / 1353	2	Yes	Yes	Yes***	Yes	Yes* (Tear)	No	
A2 / 1354	2	Yes	Yes	Yes***	Yes	No*	No	
A3 / 1355	1	Yes	Yes	Yes***	Yes	No	Yes** (circ)	
A4 / 1356	1	Yes	Yes	Yes***	Yes	No	Yes* (Tear)	

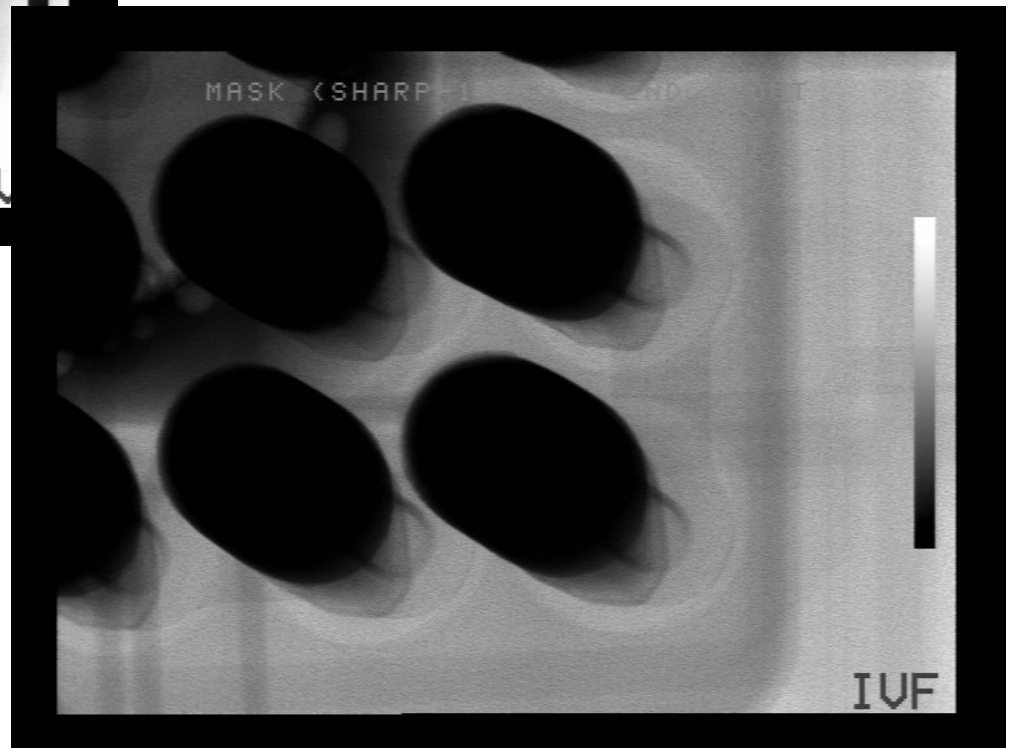


3D X-Ray After mounting



Circular pad

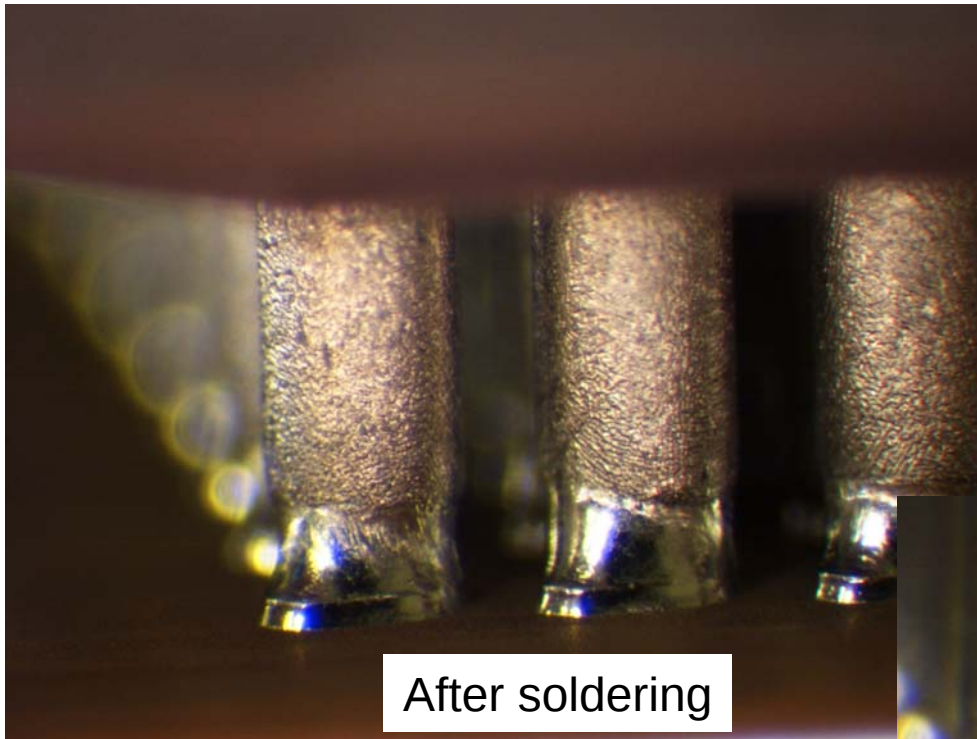
Teardrop pad



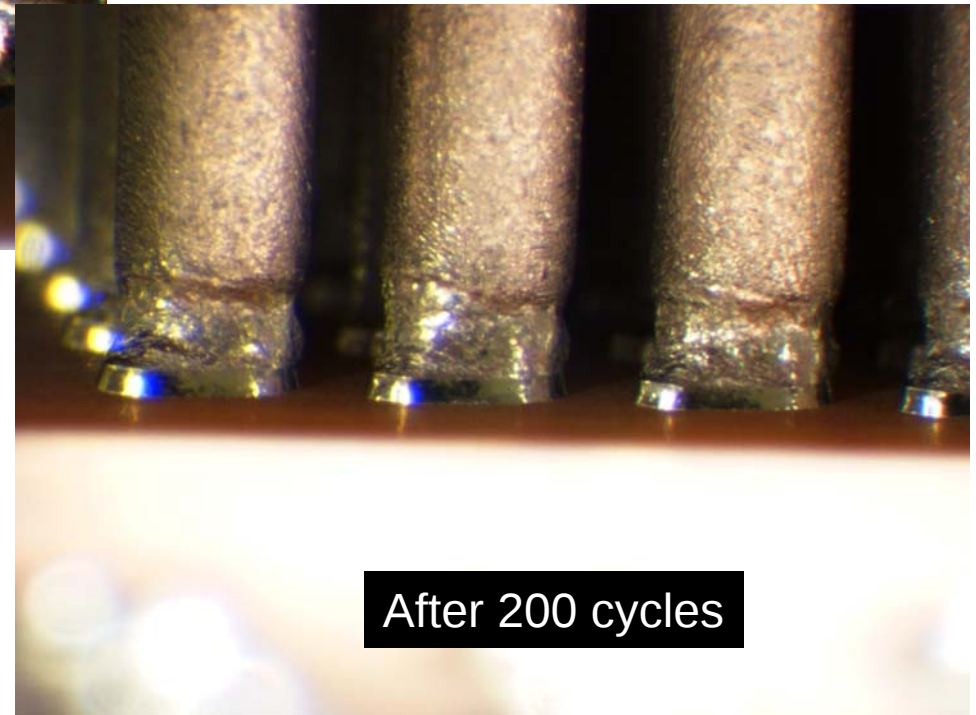
Results after 500 cycles

- ❑ Electrical: No failures detected
- ❑ Visual: No cracks observed in 60x magnifications

Visual Inspection - teardrop (1356)

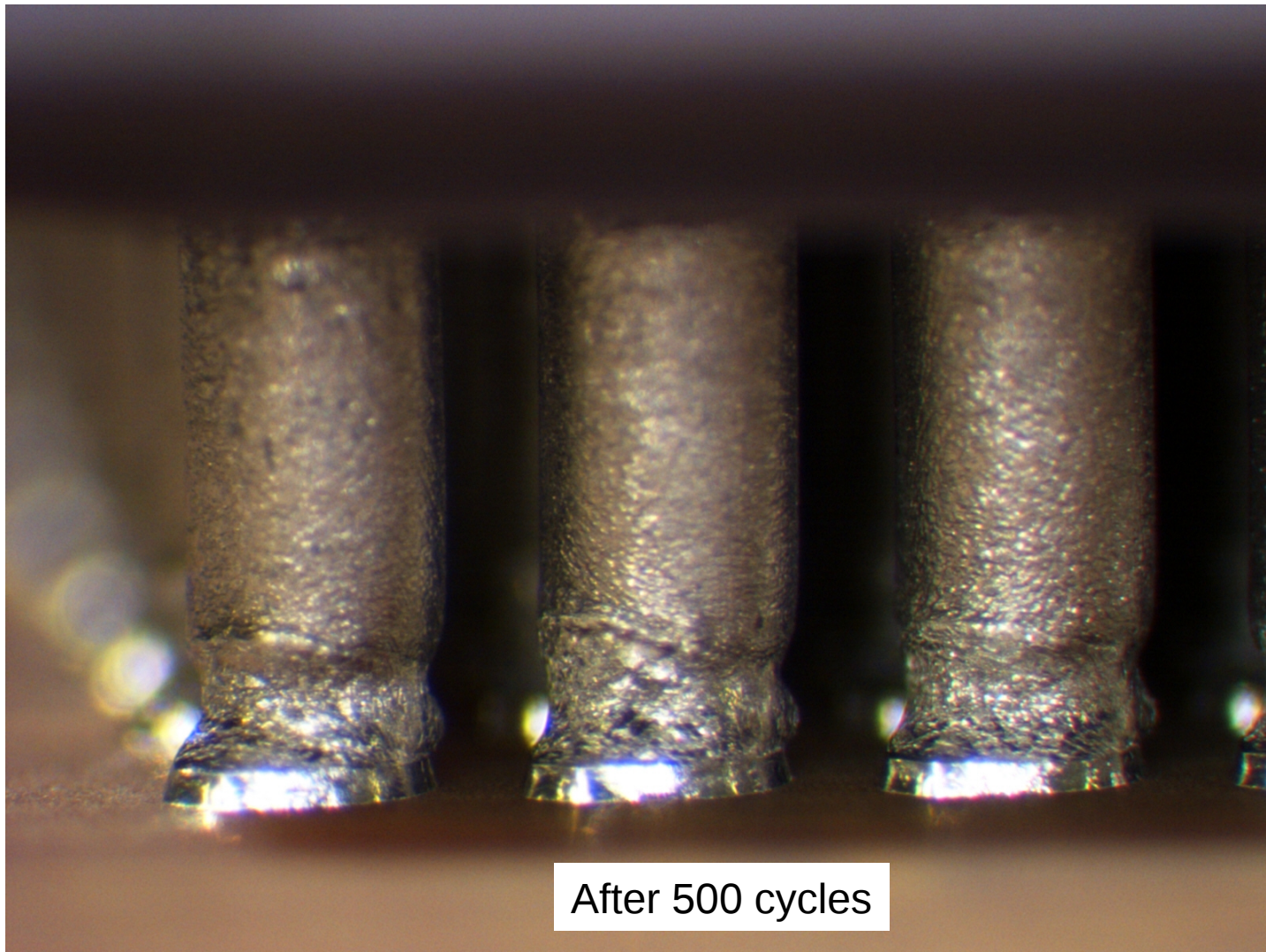


After soldering

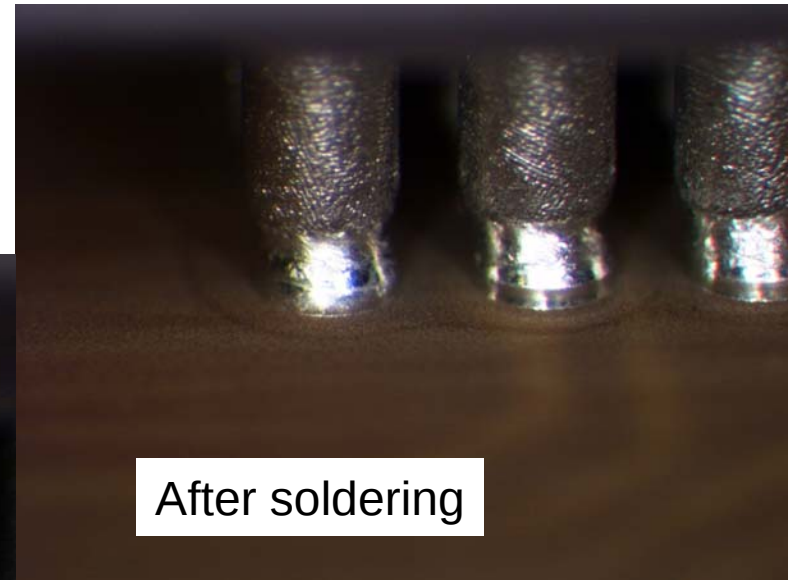
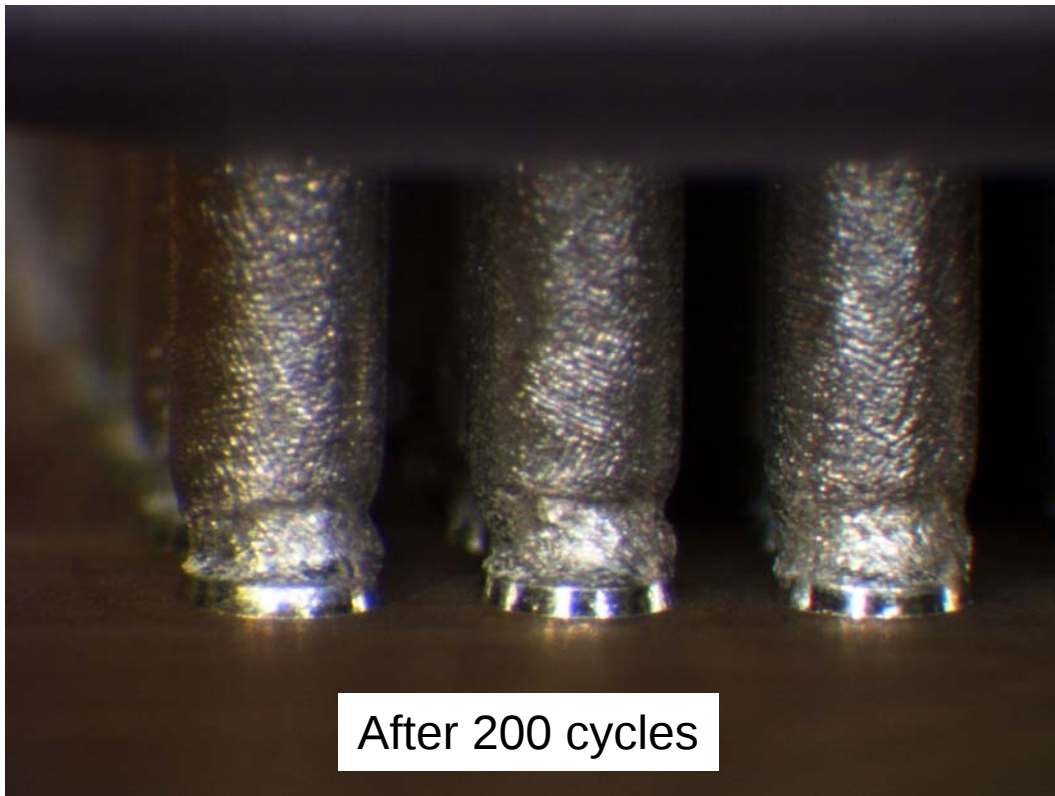


After 200 cycles

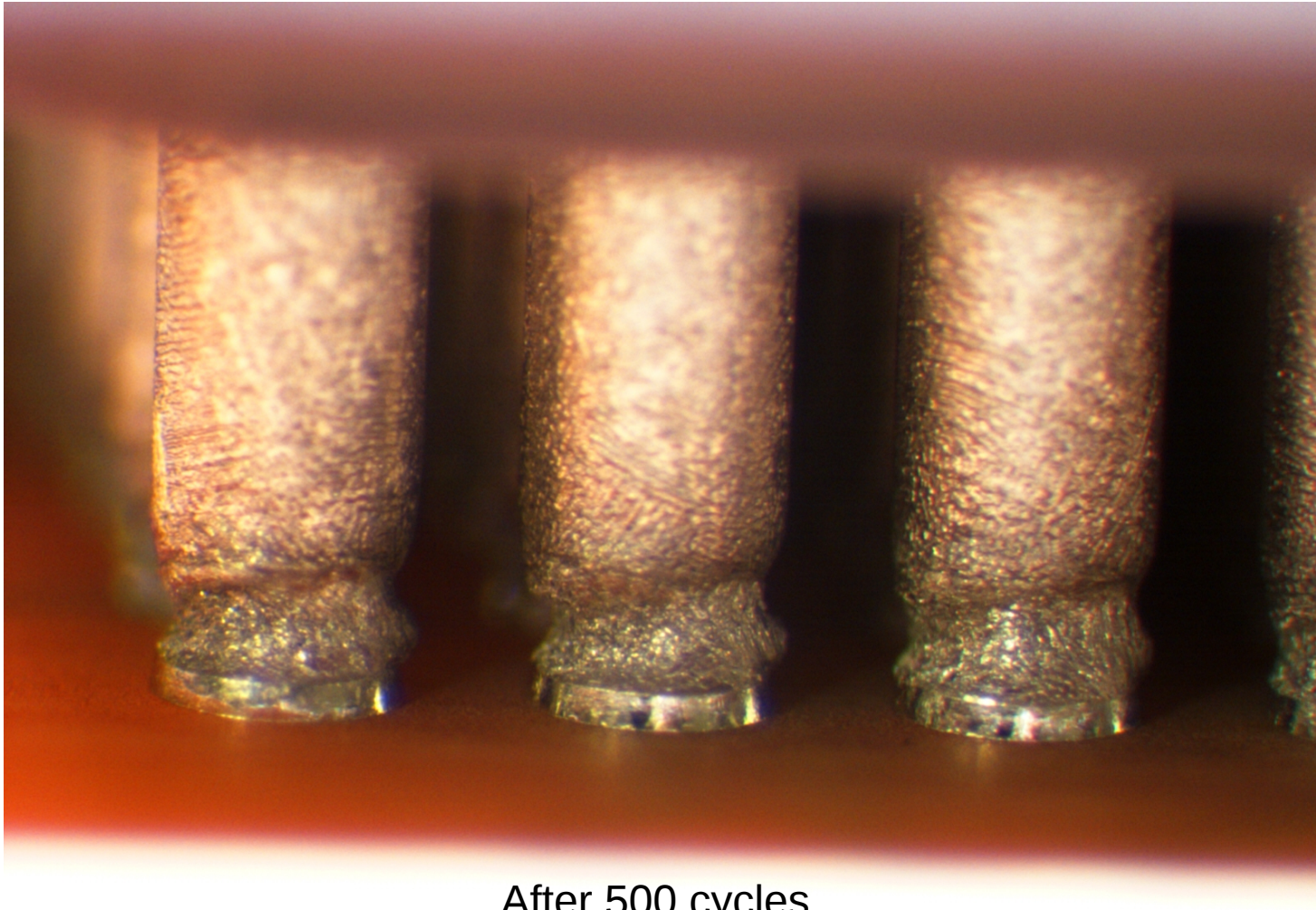
Visual Inspection - teardrop (1356)



Visual Inspection – circular pad (1353)

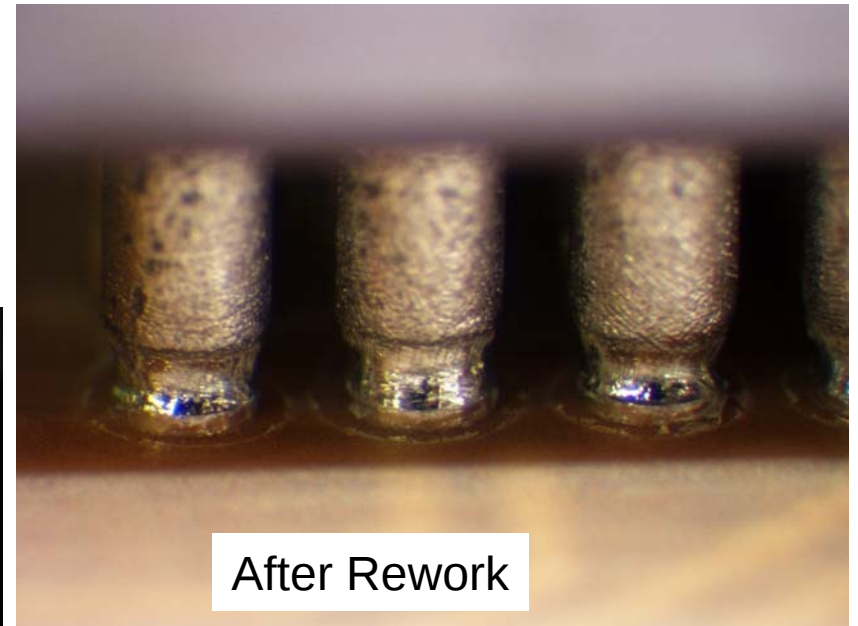
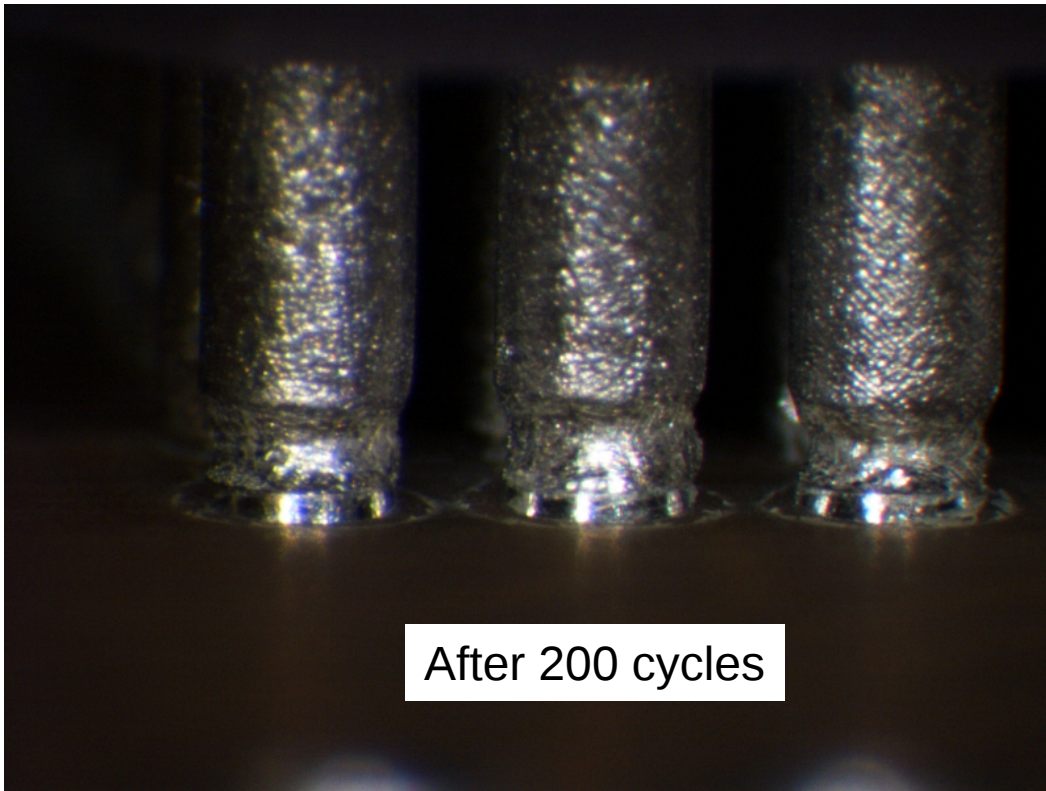


Visual Inspection – circular pad (1353)

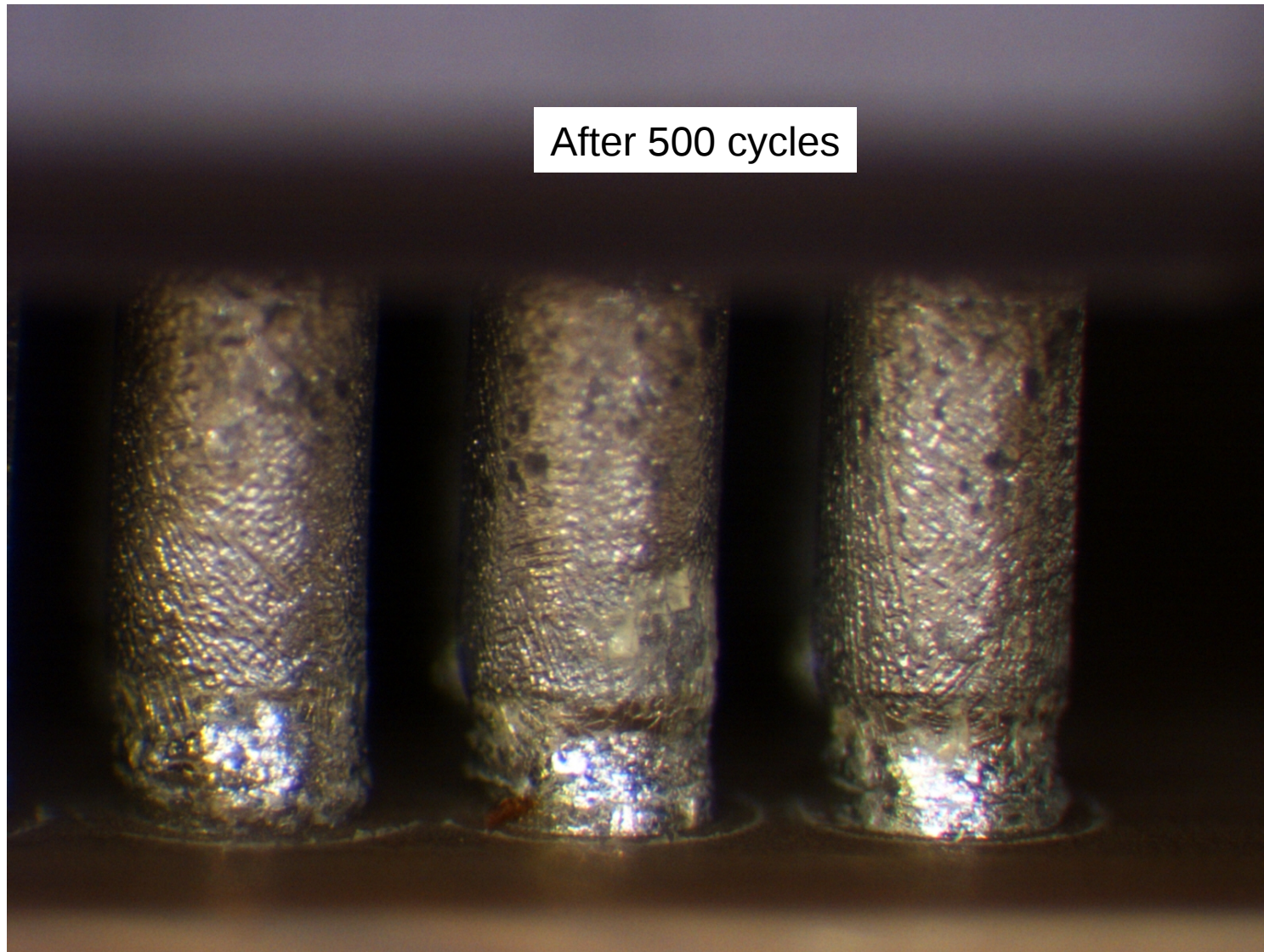


After 500 cycles

Visual Inspection Rework – circular pad (1354)



Visual Inspection Rework – circular pad (1354)

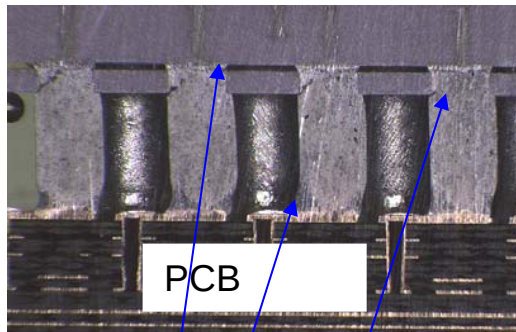


Results after 500 cycles

□ Dye penetrant:

- No cracks > 25% of the circumference of the column observed at PCB-column interface, cracks observed at interposer side

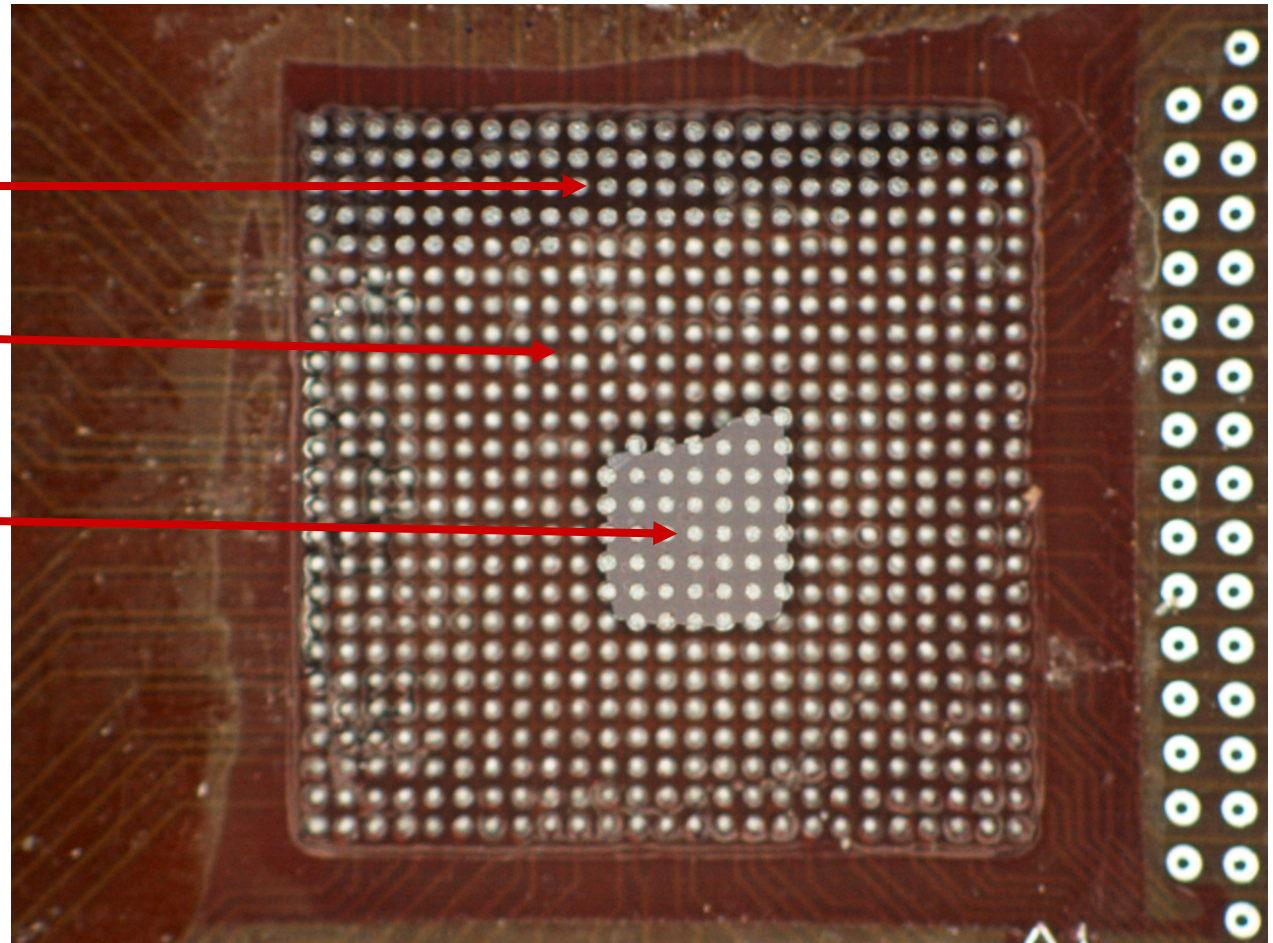
Dye Penetrant (1355)
Picture of board After 200 cycles



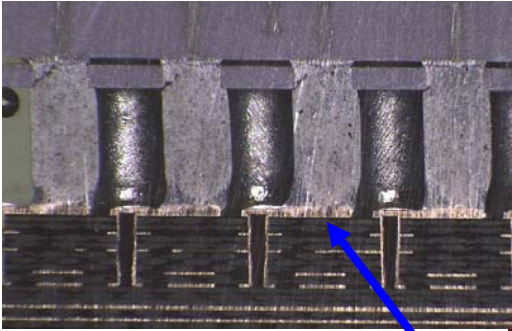
Columns

Break at Pads
on PCB

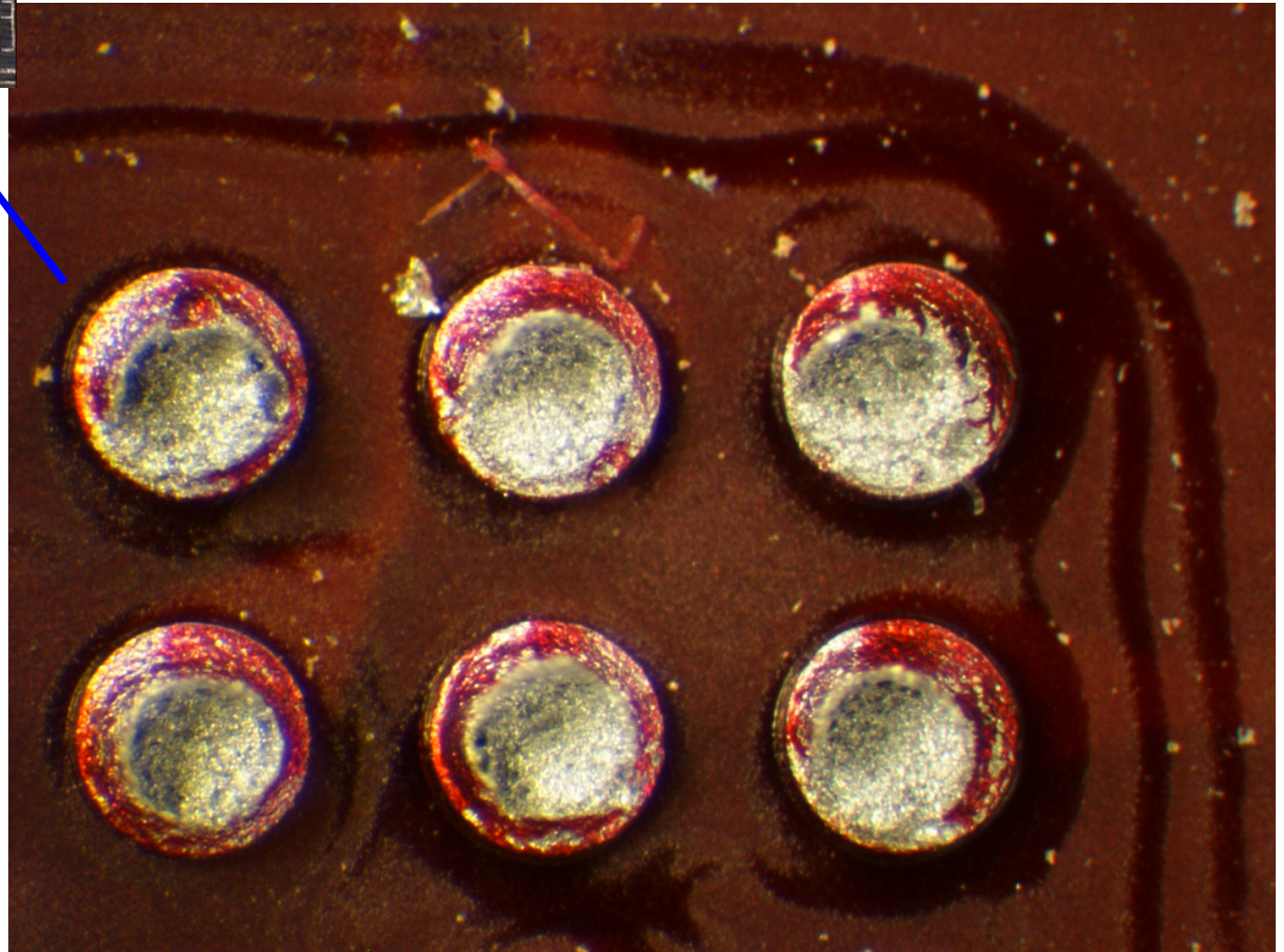
Break at
Package
pad



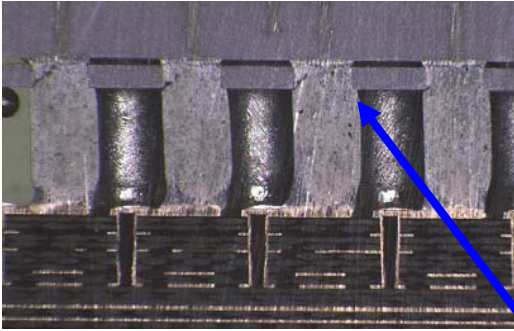
Die Penetrant (1355)
Board After 200 cycles



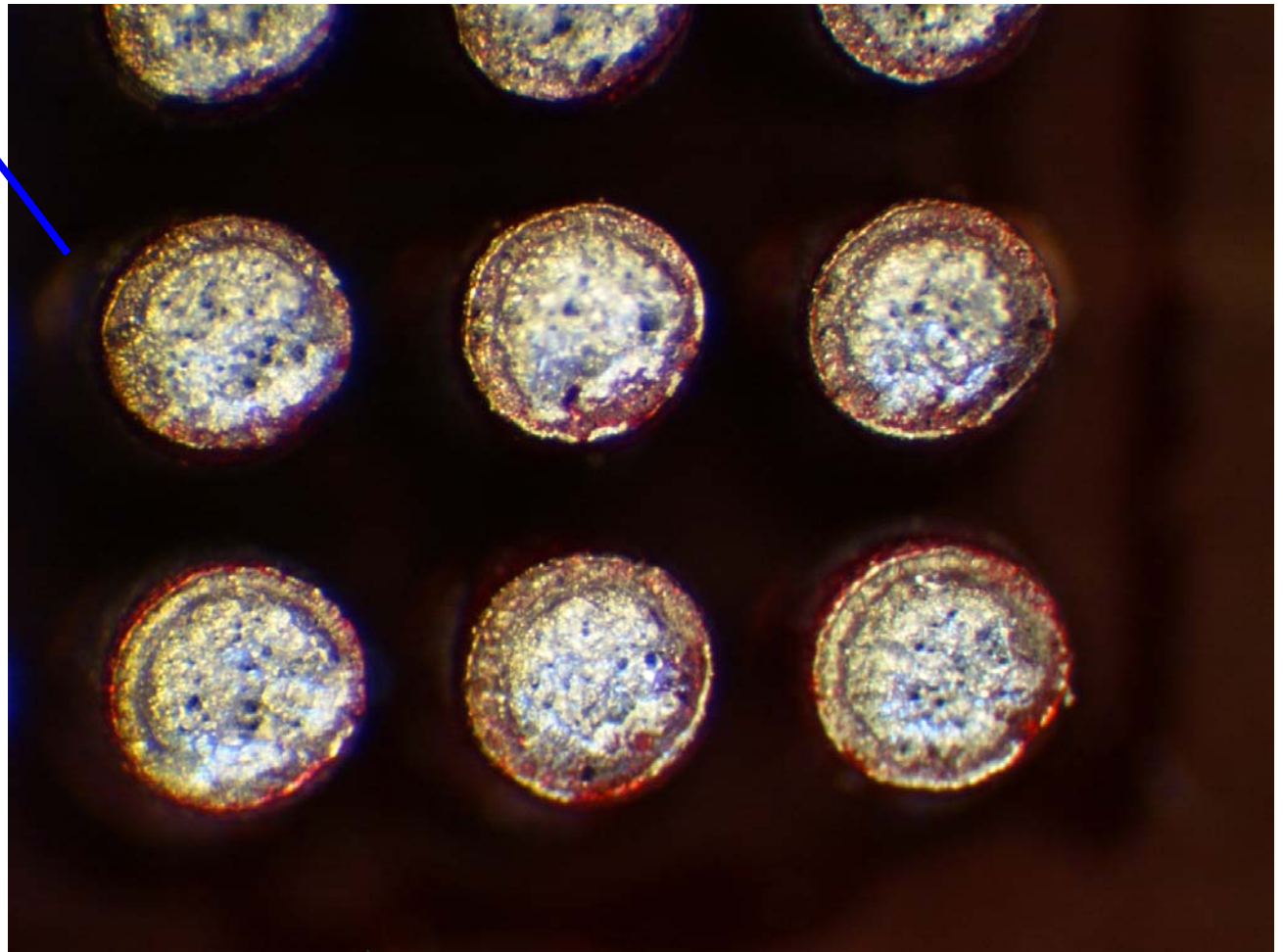
Corner Picture
Solder joint break
at PCB

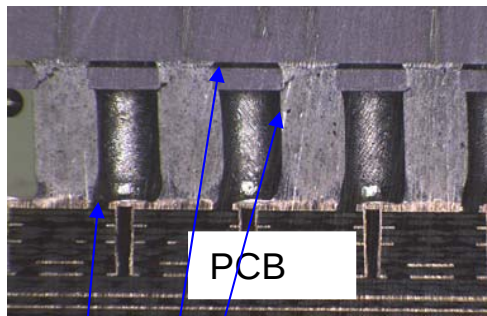


Dye Penetrant (1355)
Board After 200 cycles



Corner picture
Solder joint break
at Interposer



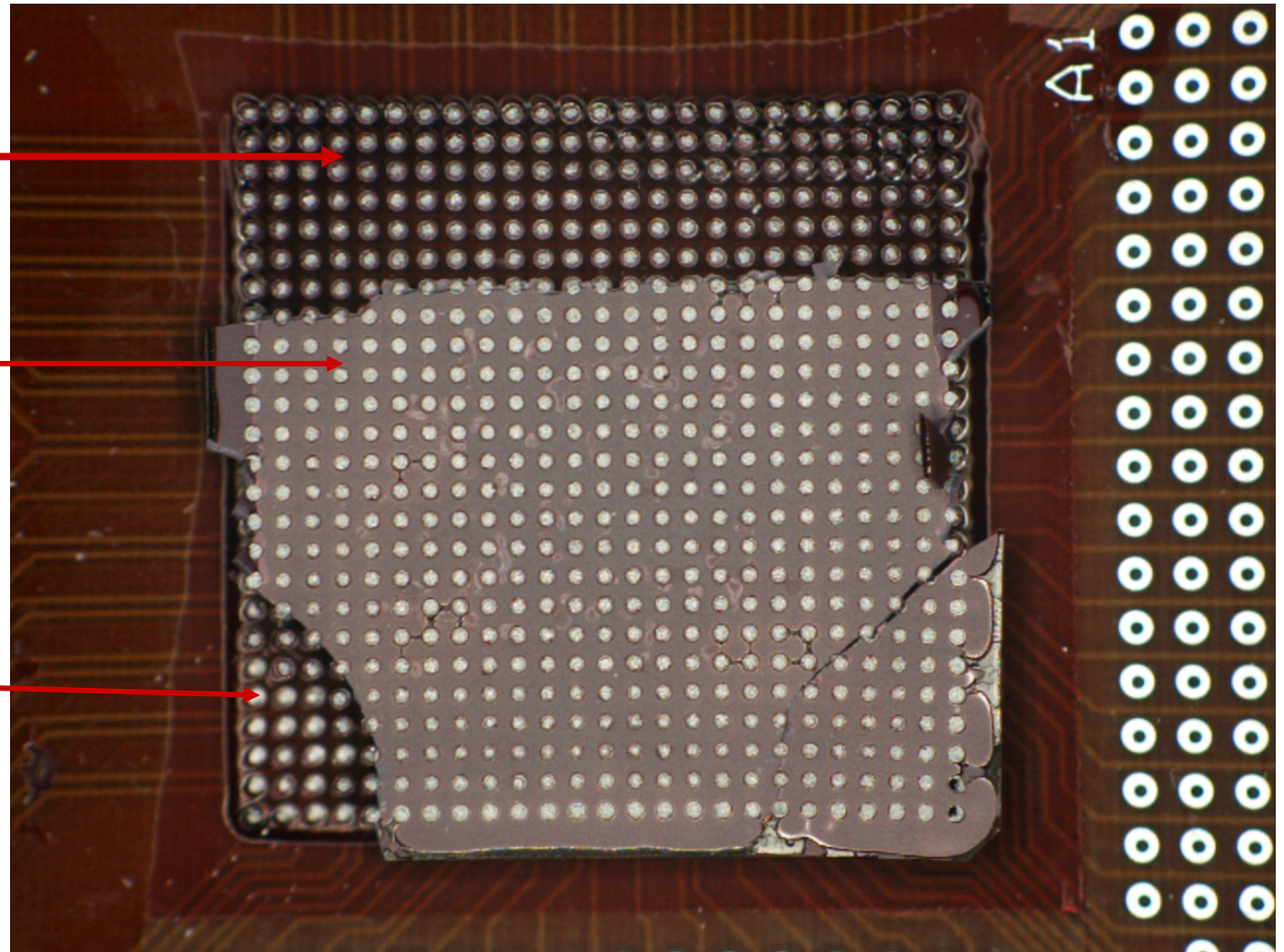


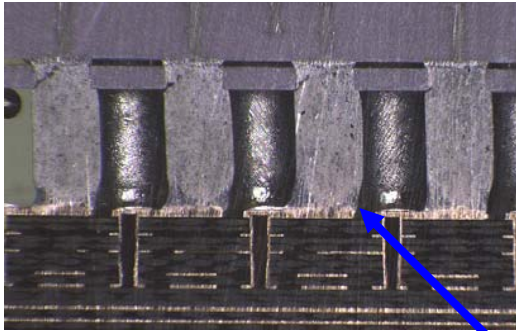
Columns

Interposer
Ceramic

Pads on
PCB

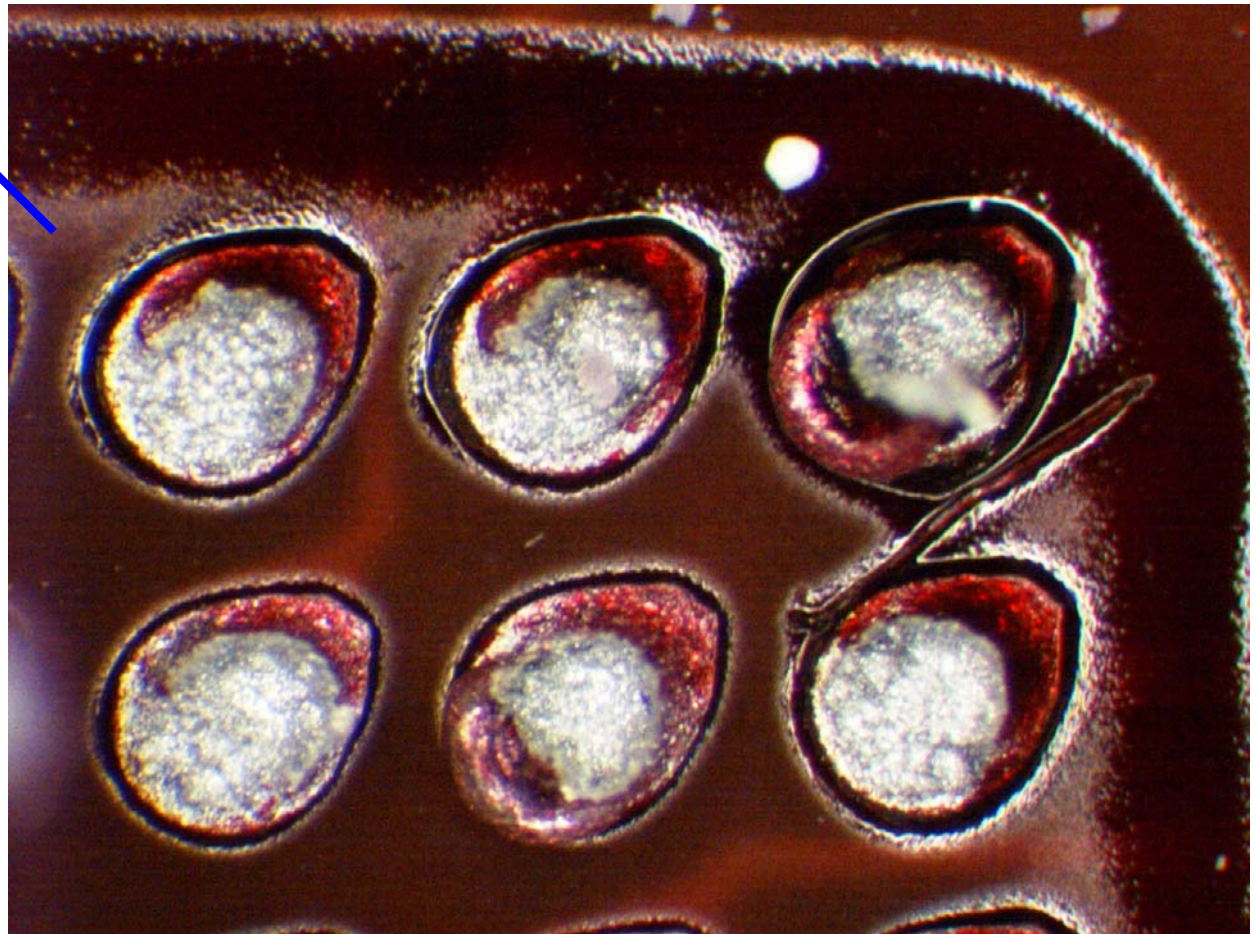
Die Penetrant (1356)
Picture of board after 500 cycles



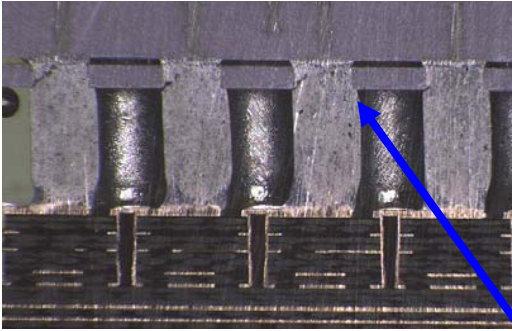


Corner Picture
Solder joint break
at PCB

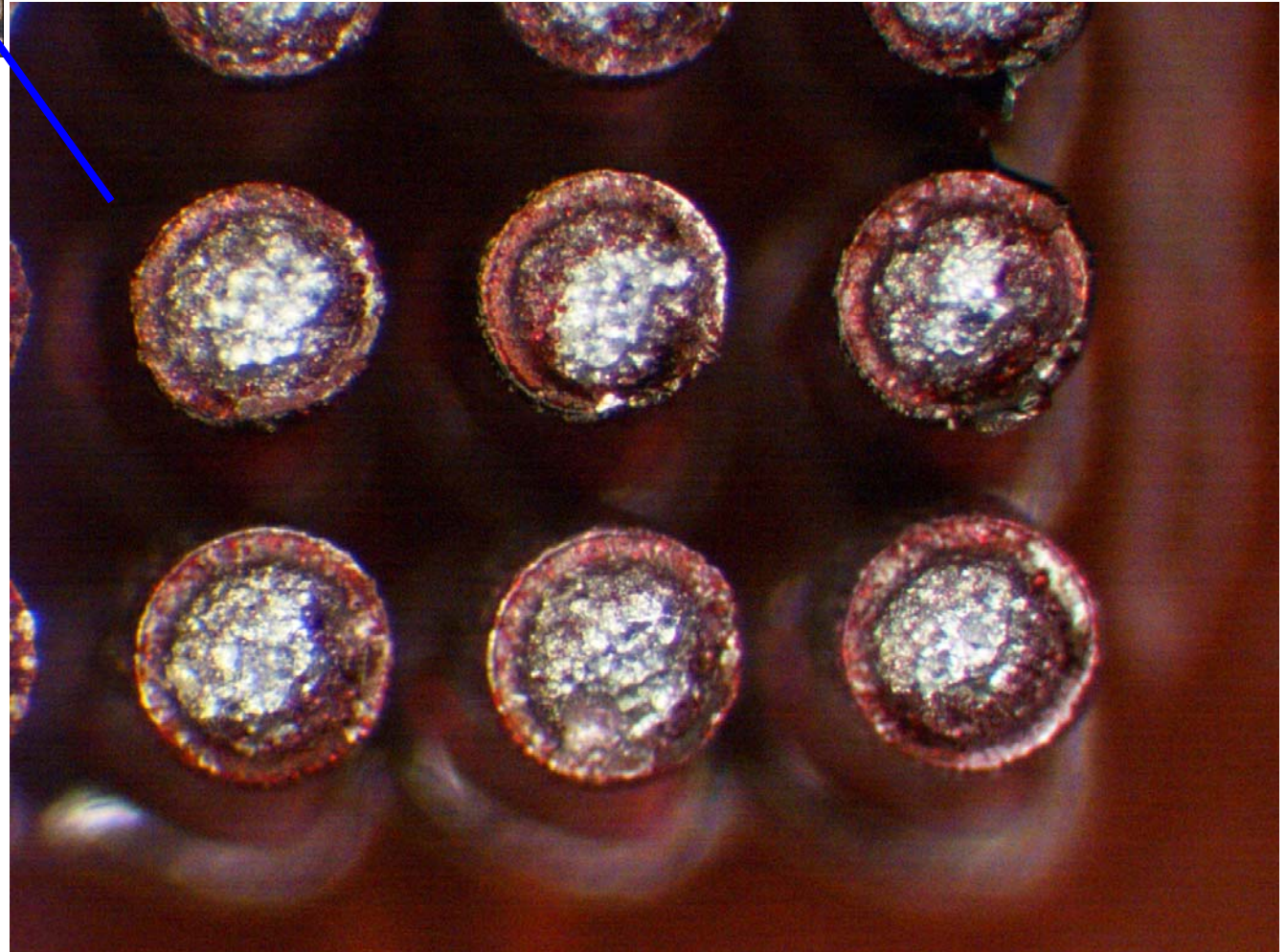
Dye Penetrant (1356)
Picture of board after 500 cycles

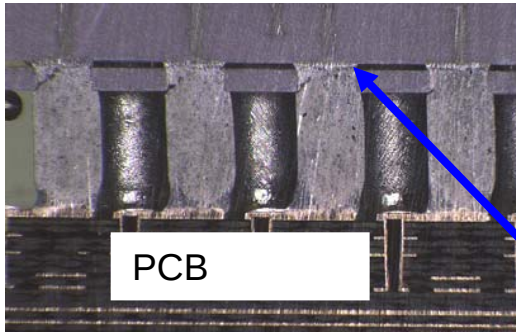


Dye Penetrant (1356)
Picture of board after 500 cycles



Corner Picture
Solder joint break
at Interposer

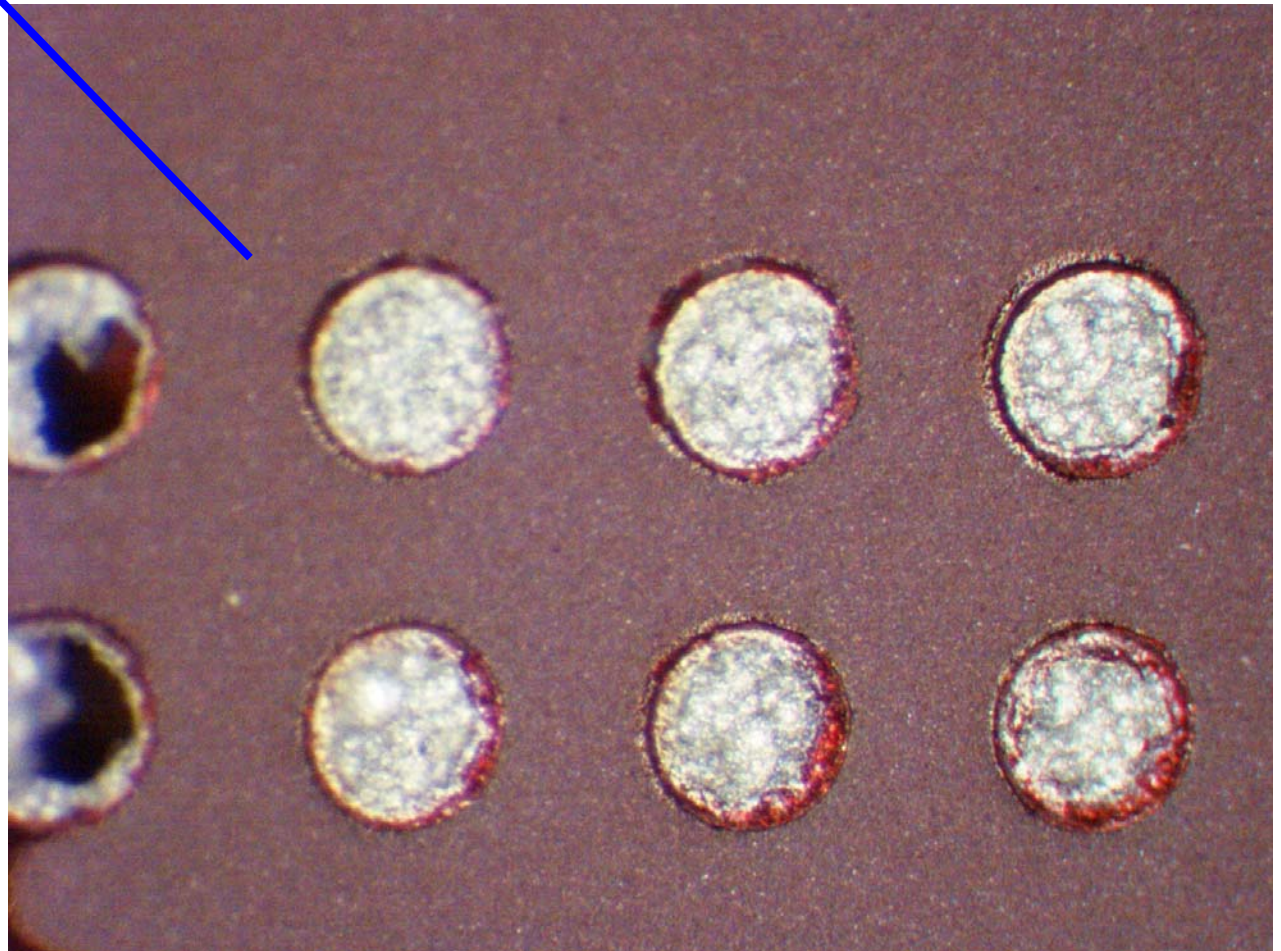




Dye Penetrant (1356)
Picture of board after 500 cycles

Corner Picture
Solder joint break
at package pad

Dye penetrant difficult
to flow between ceramic
and package



Results after 500 cycles

□ Micro section:

- No cracks > 25% of the circumference of the column observed at PCB-column interface

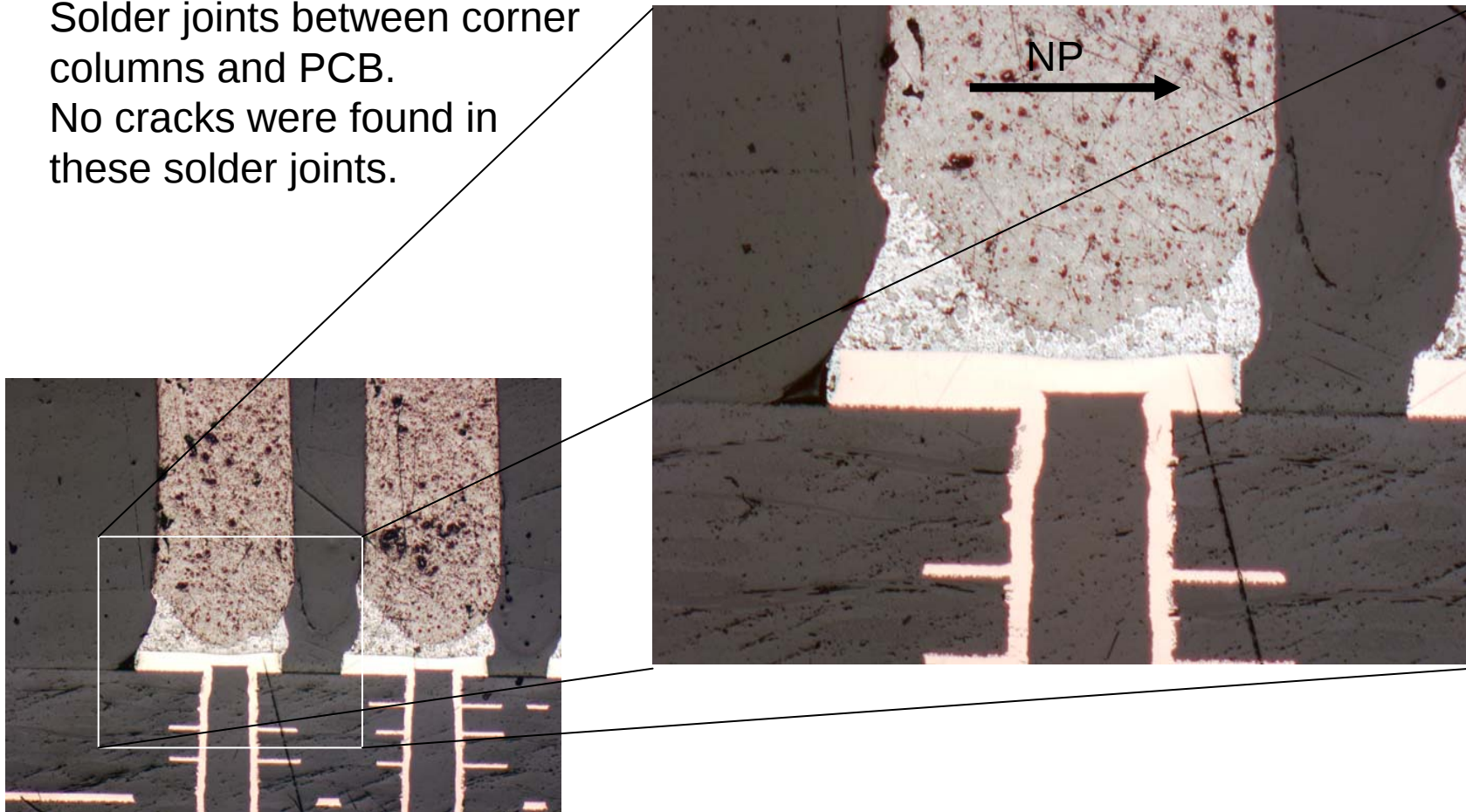
Micro Sectioning of CGA 625



Cross sections for the micrographs

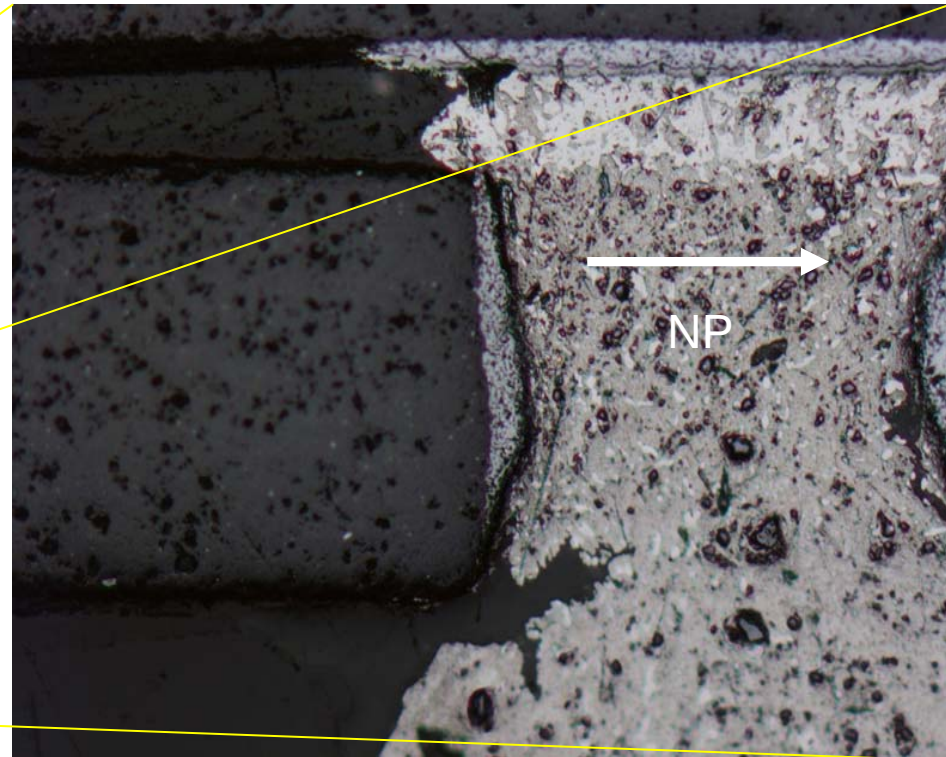
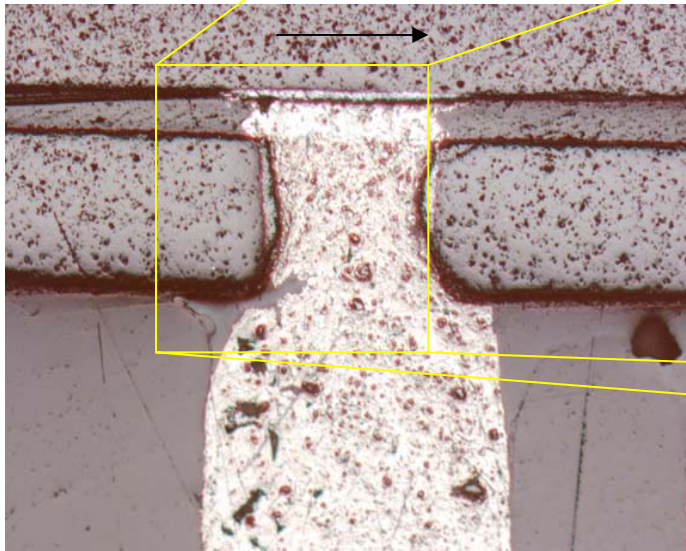
Micro Sectioning (1353)
Picture of board after 500 cycles

Solder joints between corner
columns and PCB.
No cracks were found in
these solder joints.



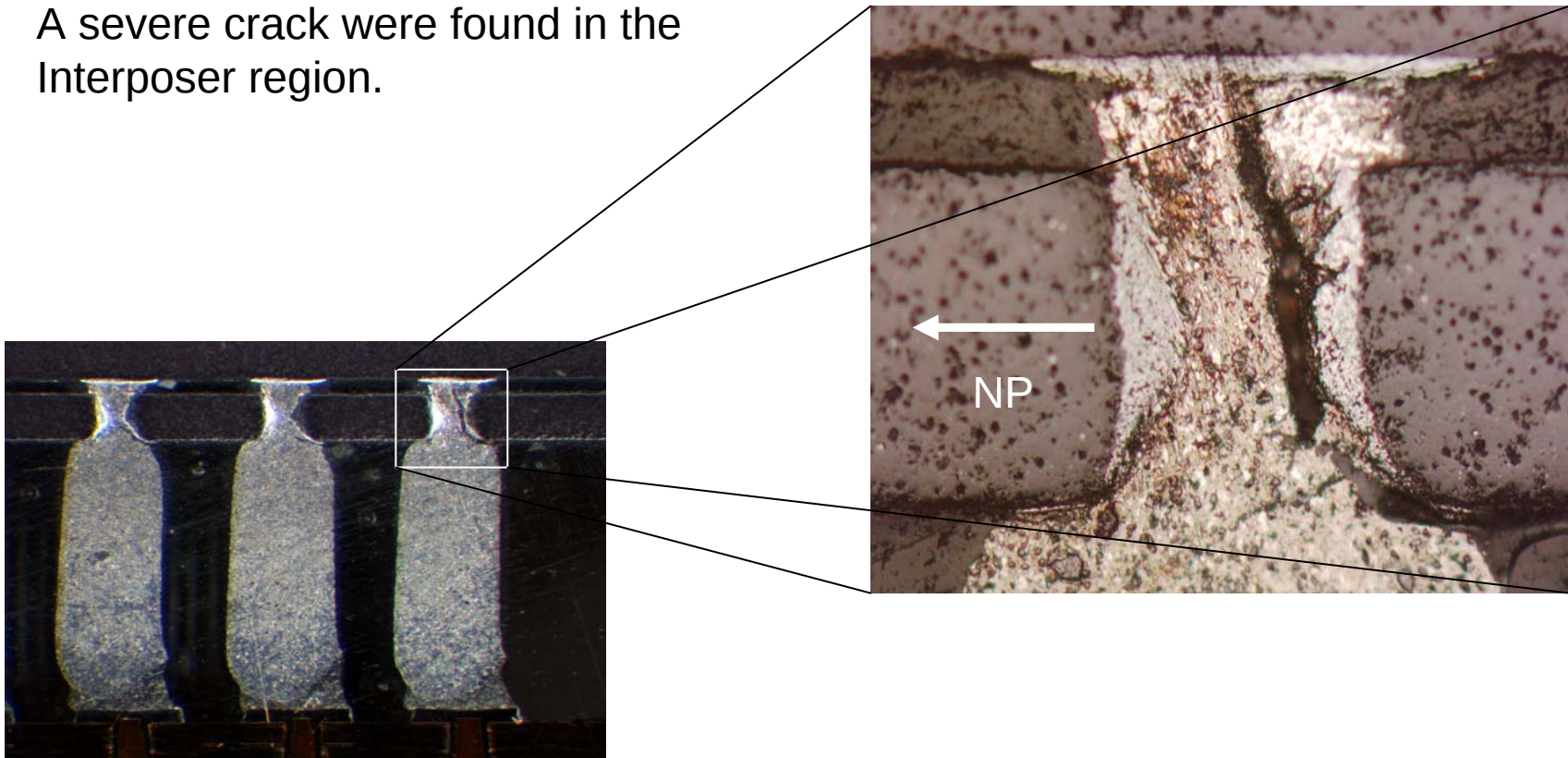
Micro Sectioning (1353) Picture of board after 500 cycles

Solder joints between corner columns and package.
Cracks (typical) were found along the interposer.

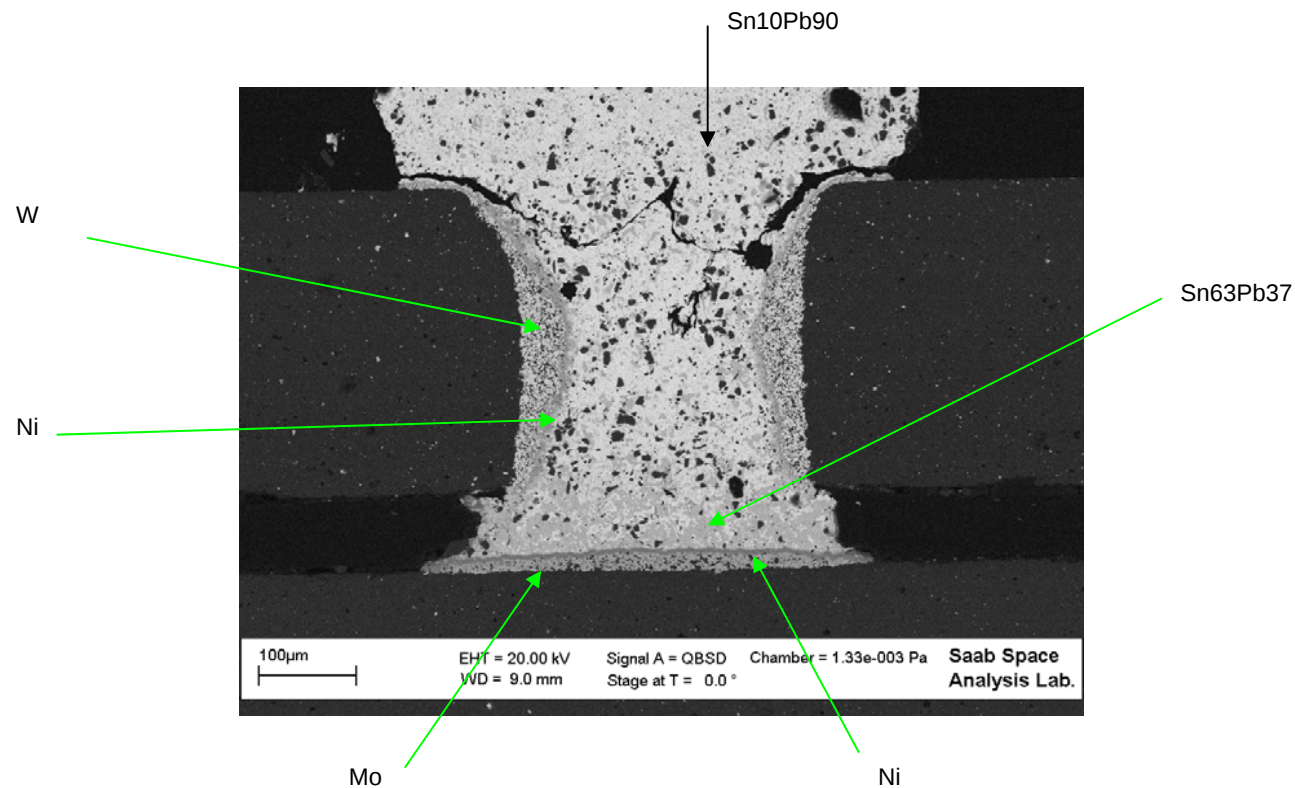


Micro Sectioning (1353)
Picture of board after 500 cycles

Solder joints between corner
columns and package.
A severe crack were found in the
Interposer region.



Material analysis of the column / package interface





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Thank You for Your Attention