phoenix|x-ray

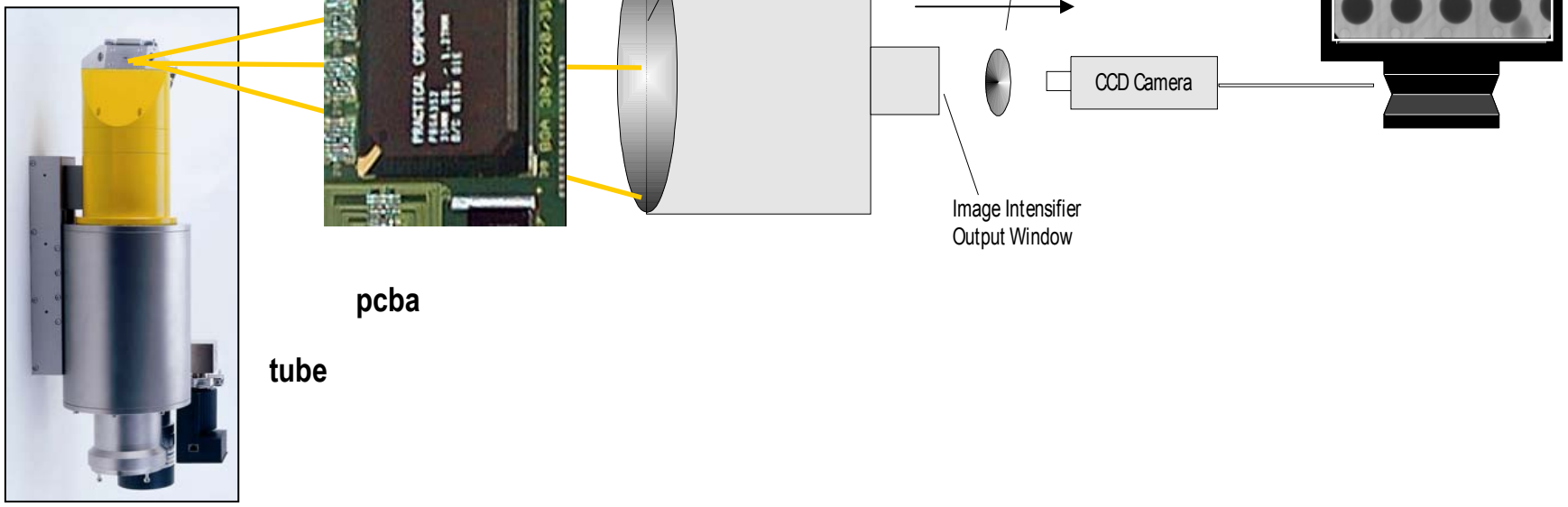
ovhm technology

- Standard X-ray inspection
- ovhm technology
- Applications
- automatic wetting inspection
- Summary

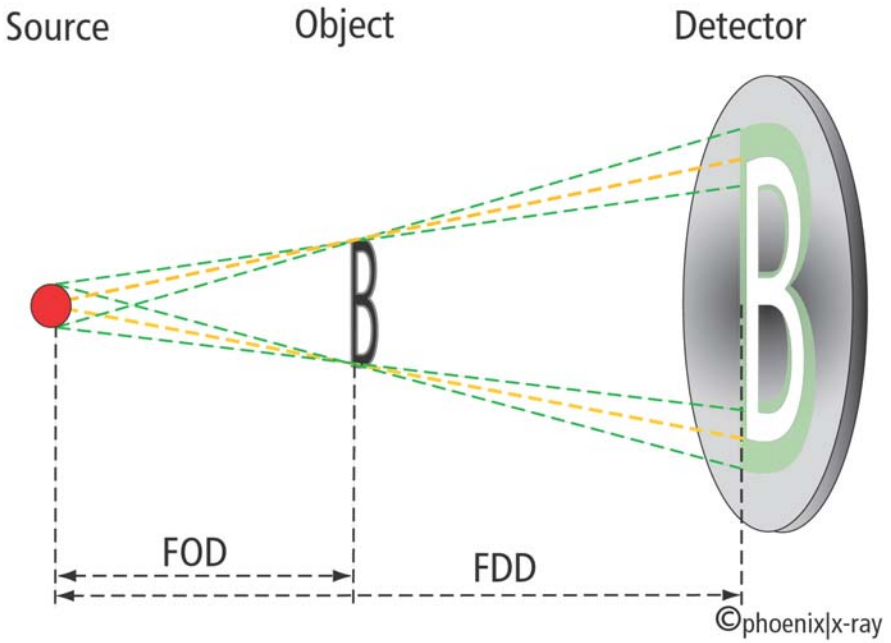
Bob Mazuik

Standard 2D X-ray inspection

The X-ray image results from:
- Different absorption coefficients of elements (solder, moulding, etc.)
- Absorption changes with the material thickness



Fundamentals of X-ray technology



- Geometrical magnification = FDD / FOD
- Lateral resolution (at large magnification) = source size
- Contrast depends mainly on the detector

V.E. Cosslett

W.C. Nixon

Cambridge 1951

"X-ray Shadow Microscope"

Nature 10 (1951) pp.24

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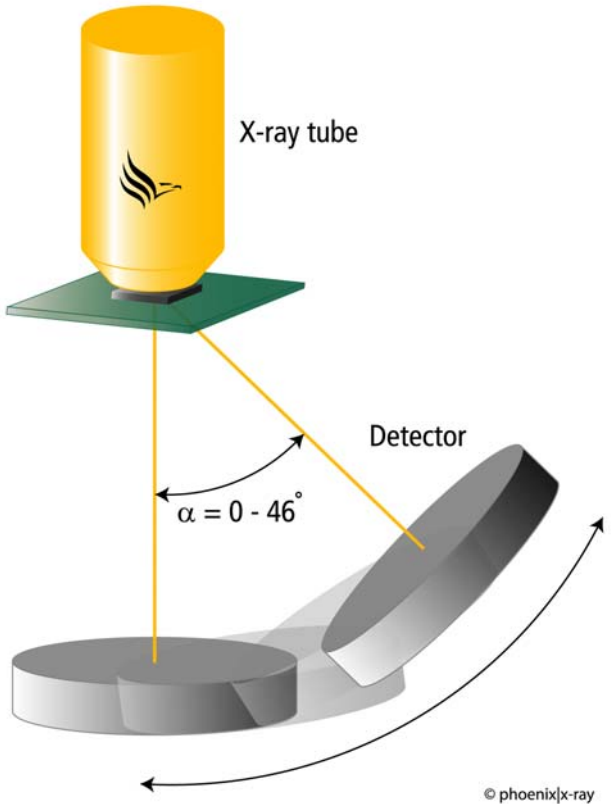

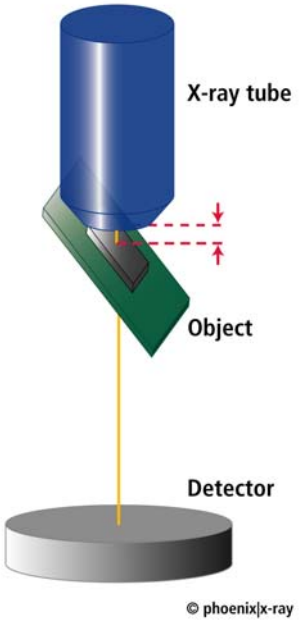

- The sample needs not to be tilted using the ovhm technique. Hence, there is no loss of magnification due to longer focus-object distance.

Advantages

no loss of magnification in oblique view

⇓

higher defect detectability

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no object tilting (isocentric mode)

⇓

easier manipulation

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realistic image

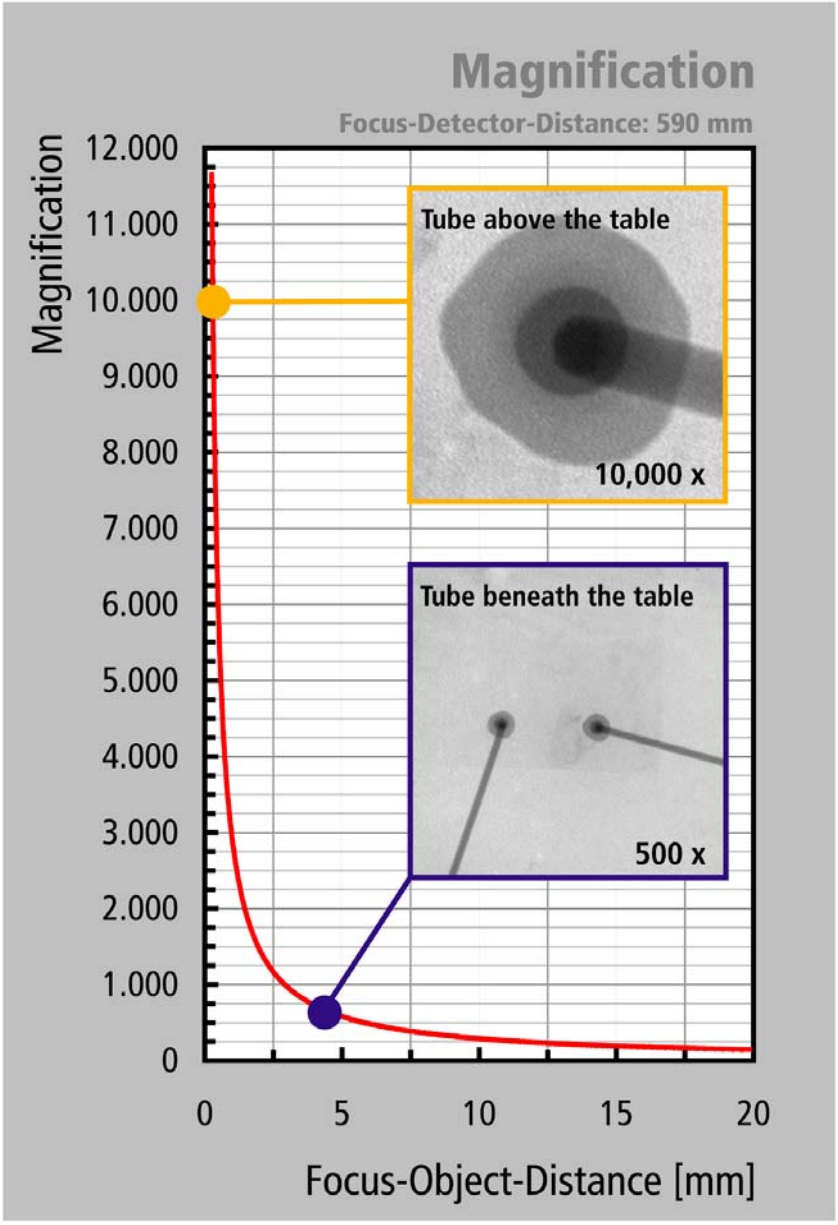
⇓

easy interpretation

Magnification Advantage

The magnification increases with a smaller Focus-Object Distance.

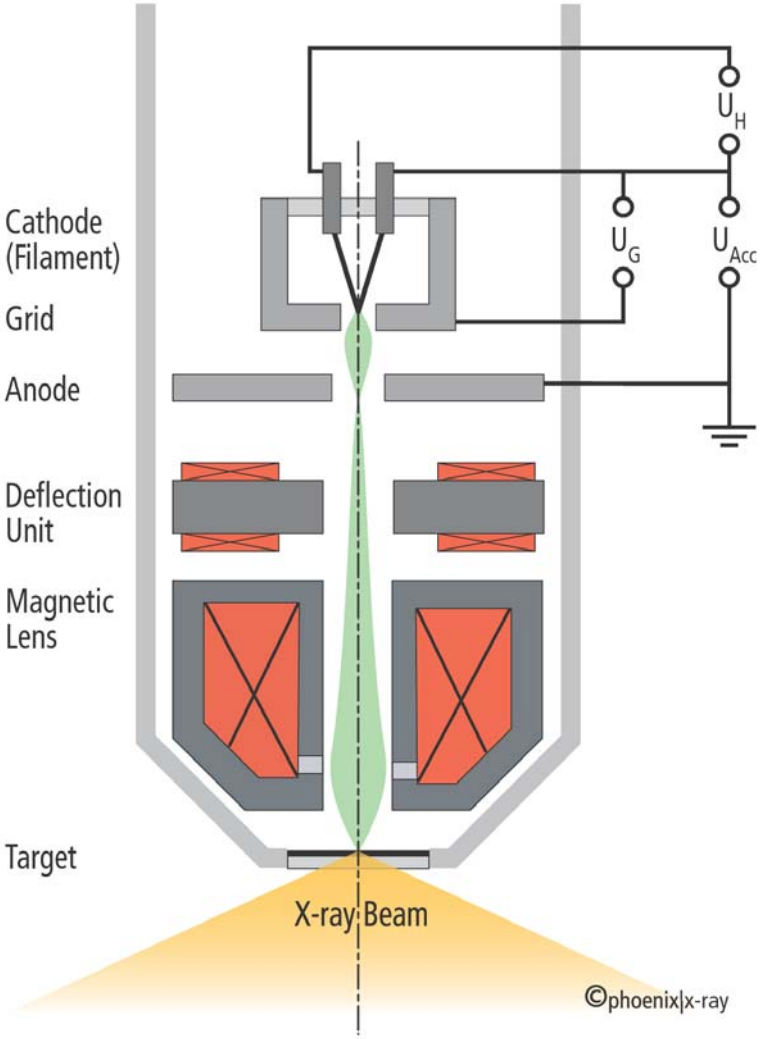
Small Focus-Object Distance changes result in large magnification differences.



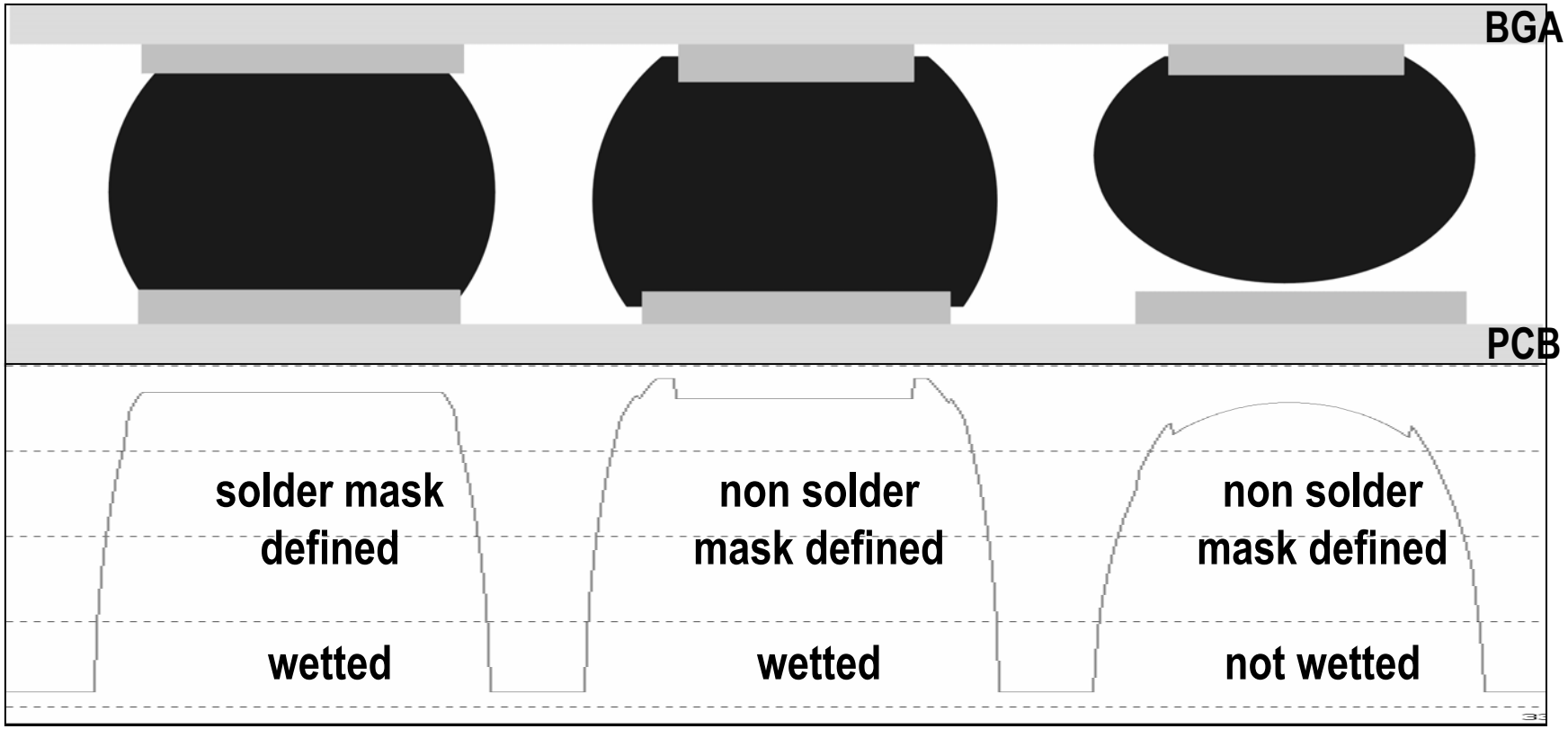
X-ray tubes

Beam angle must by higher as to achieve the ovhm angle (in general 170°)

For high magnification the tube must be mounted on the top of the X-ray system in order to get as close as possible to the component



Grey value distributions for different pad configurations

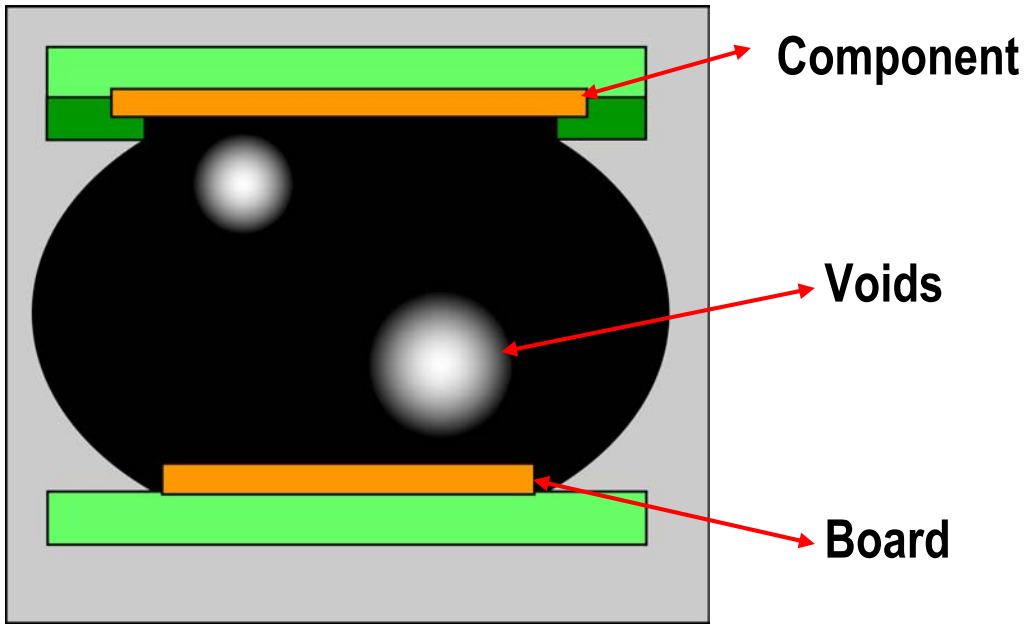


weakly absorbing

strongly absorbing

BGA, CSP and FlipChip solder joints

Typical set-up



Analysis Tasks

Integrity of board and component interconnection

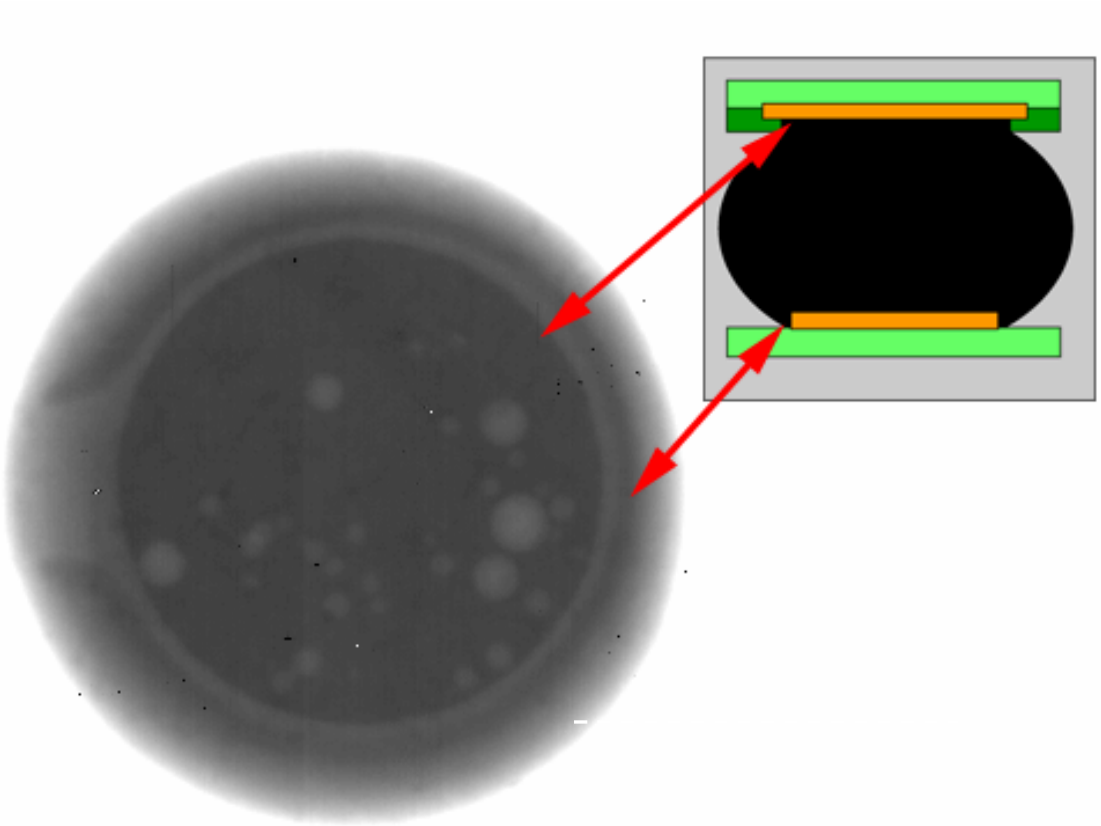
Determination of void position

Ball Shape

Detection of opens

BGA, CSP and FlipChip solder joints

analysis in top-down view



Problem

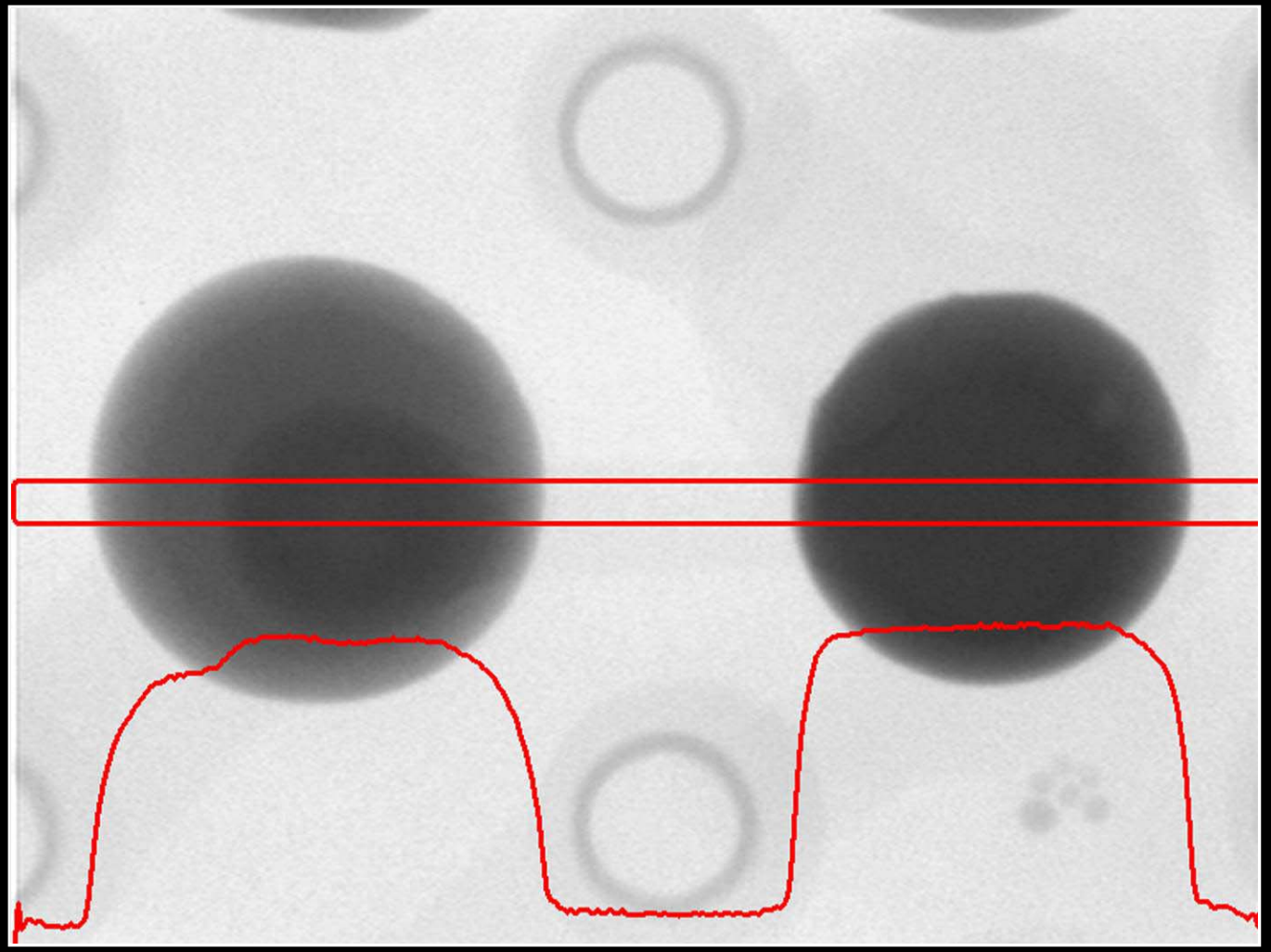
Overlap of object features in top-down images

⇓

interpretation of images requires additional information

BGA solder joints

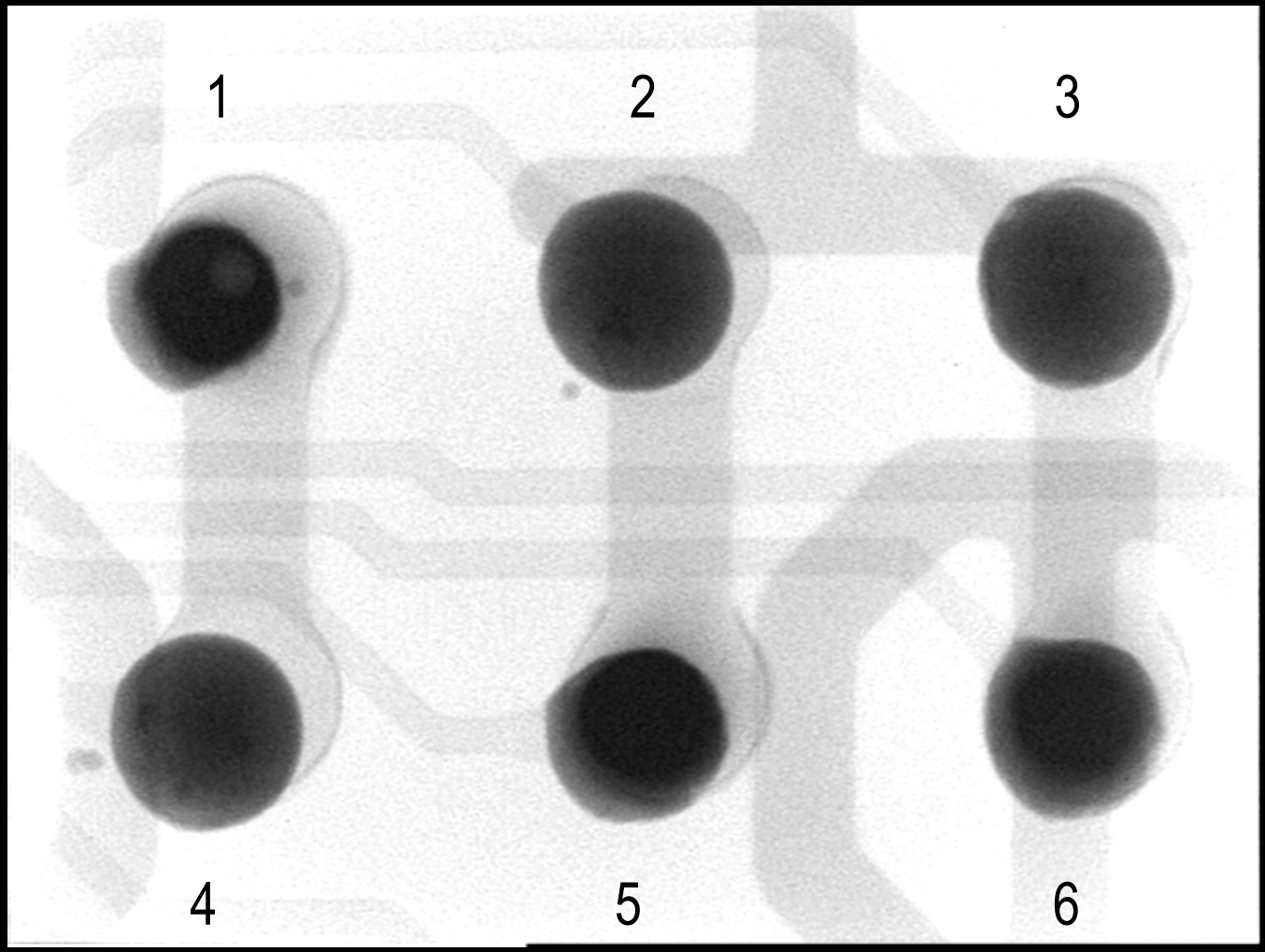
Gray level plot



- Identification of open balls with gray level analysis
- Disadvantage: Not always clear

µBGA solder joints

top down view



- Three solder joints (No. 2,3,4) are not wetting to the board pads
- One void is visible (No.1)

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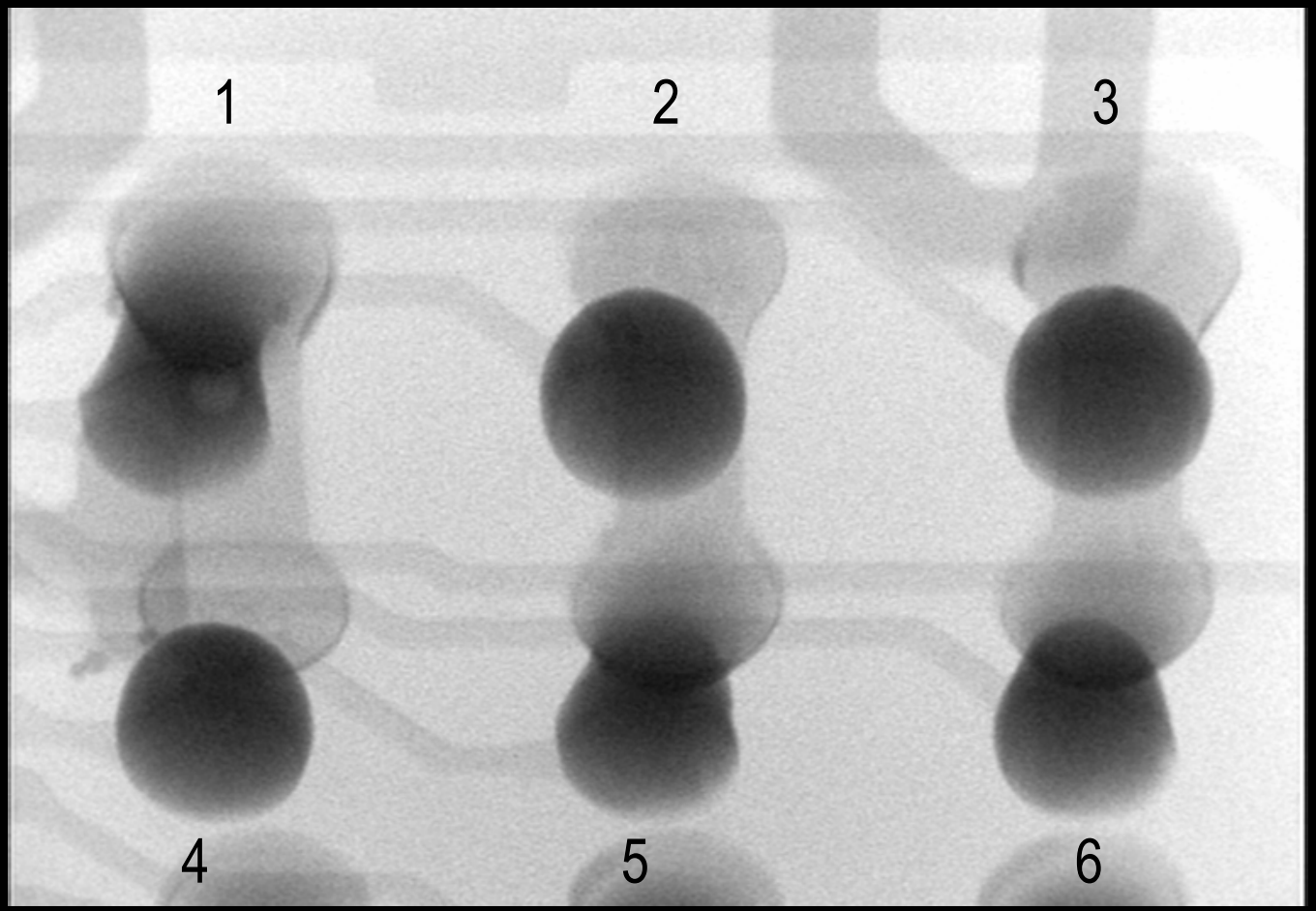
µBGA solder joints

ovhm view



- Three solder joints are clearly open (No. 2,3,4)
- The void (No.1) is located near the component pad
- The solder joint above right (No.6) is in contact to the board, but with insufficient wetting (no meniscus)

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BGA solder joints

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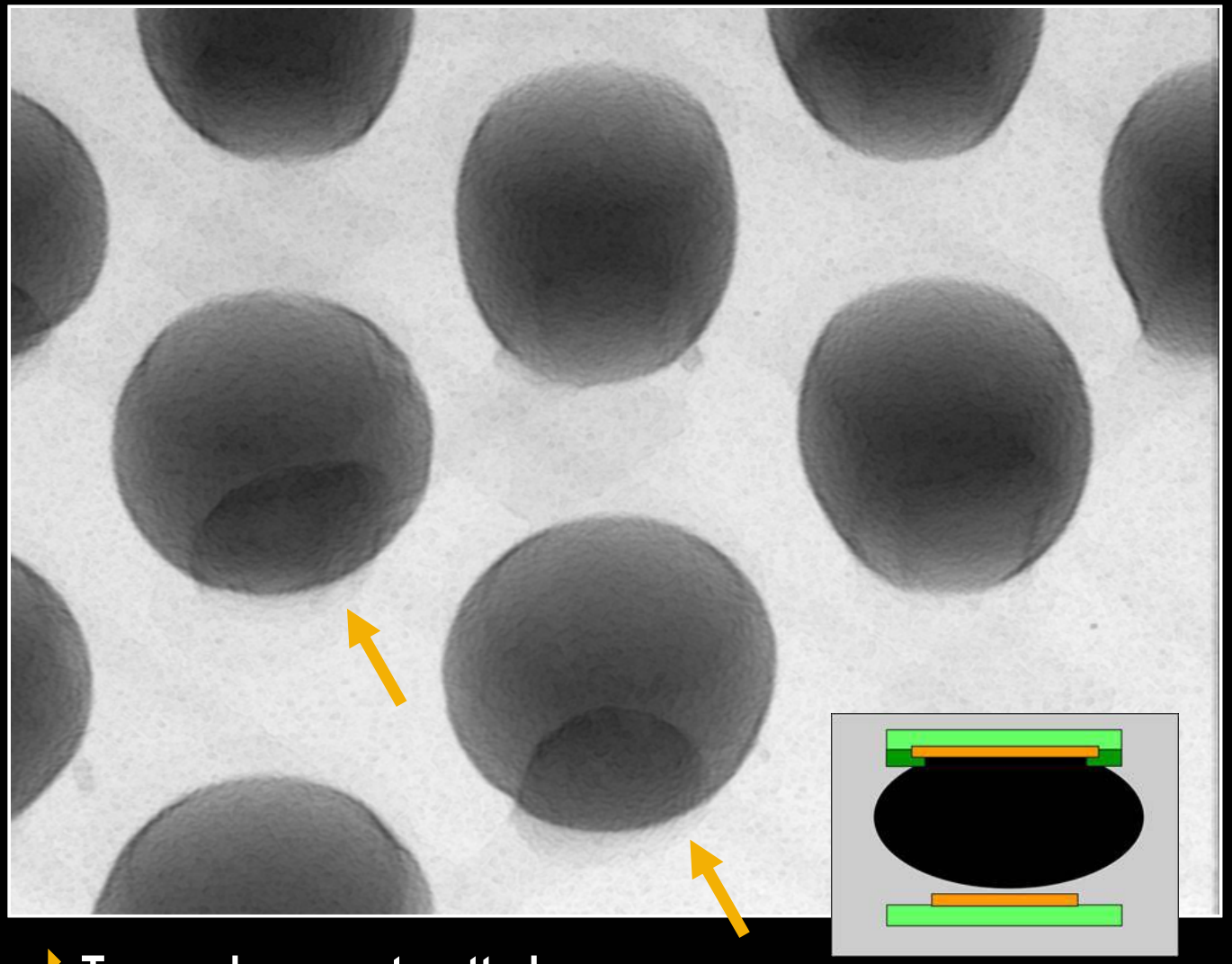
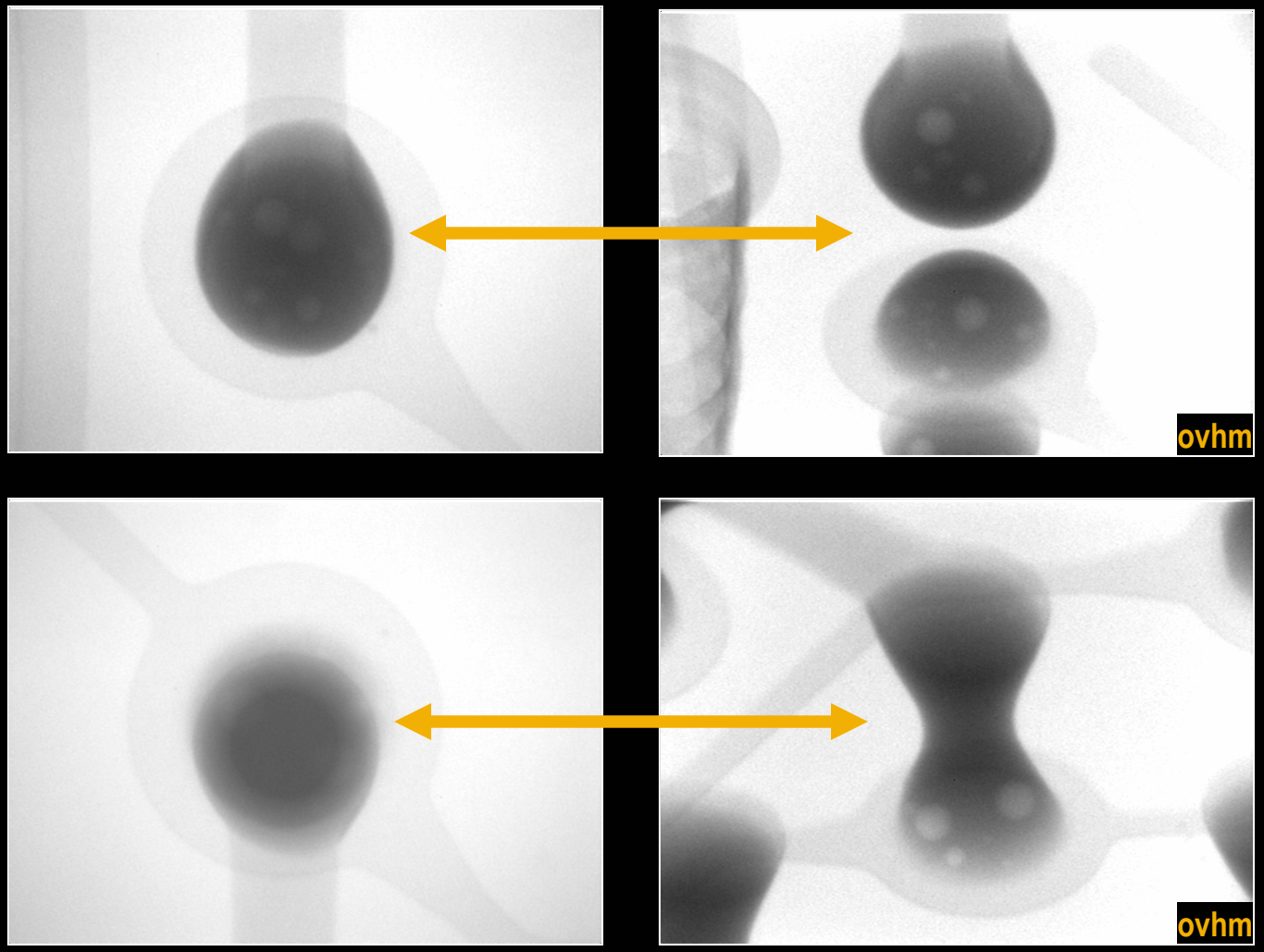


- Two pads are not wetted.

CSP
solder joints

left: topdown
right: ohvm



- The upper solder joint which looks quite normal in top-down view is shown to be definitely open in the ovhm. The lower one turns out to be just closed but strongly distorted.

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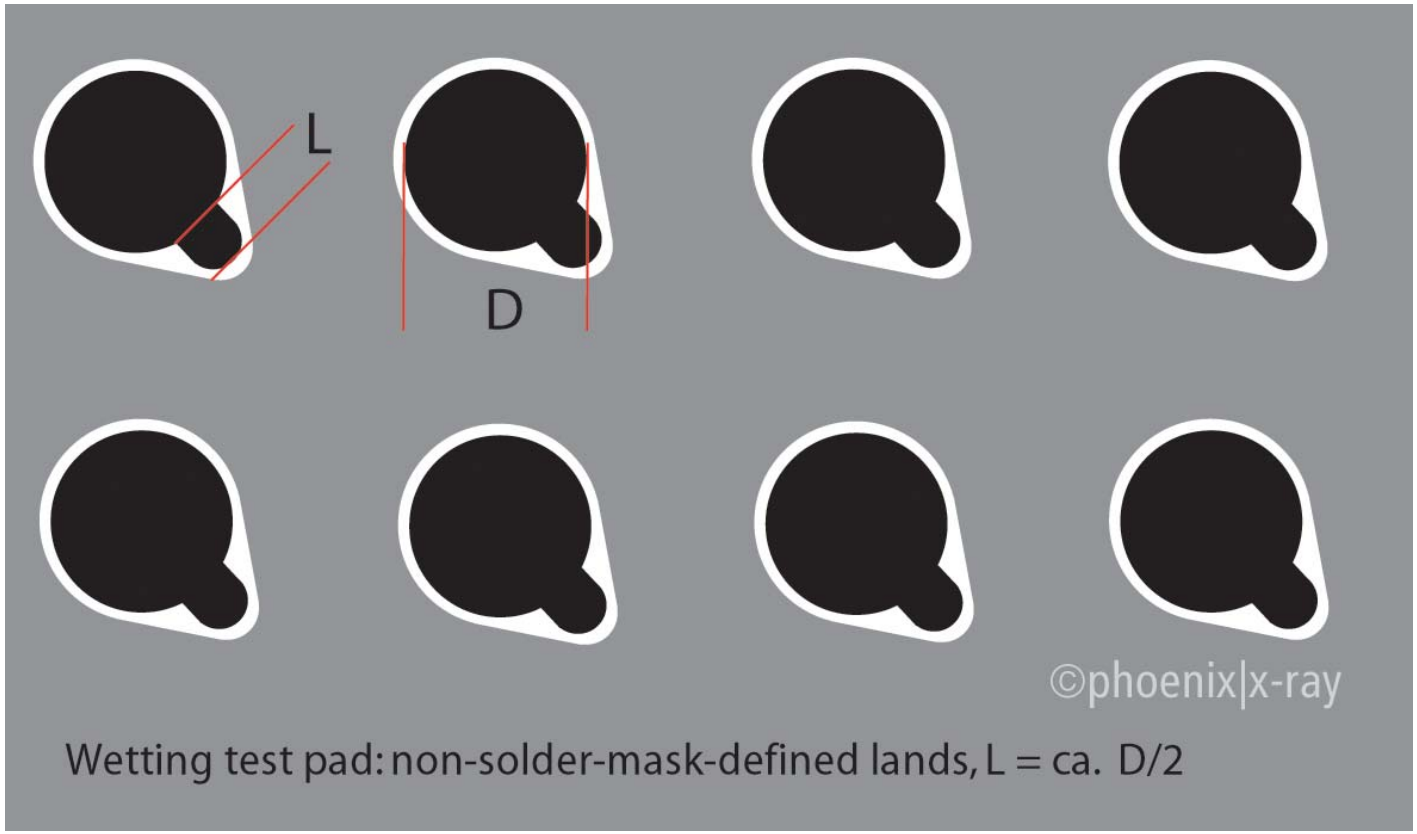
Wetting test pads

for automated wetting analysis



Wetting test pad: non-solder-mask-defined lands, L = ca. D/2

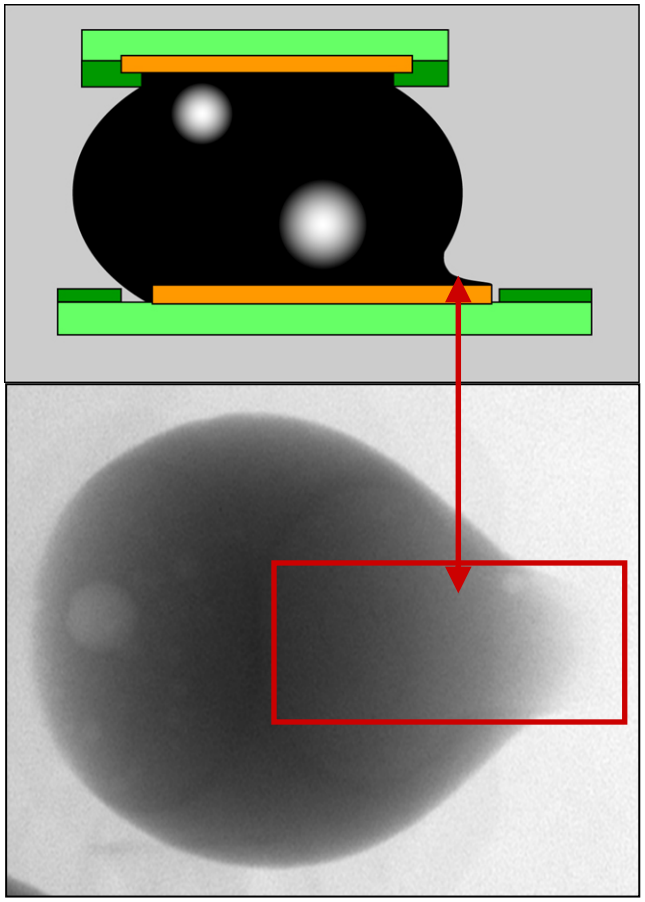
Inspection of the gradient analysis

Advantages:

No influence
of other properties,
therefore it is unique.

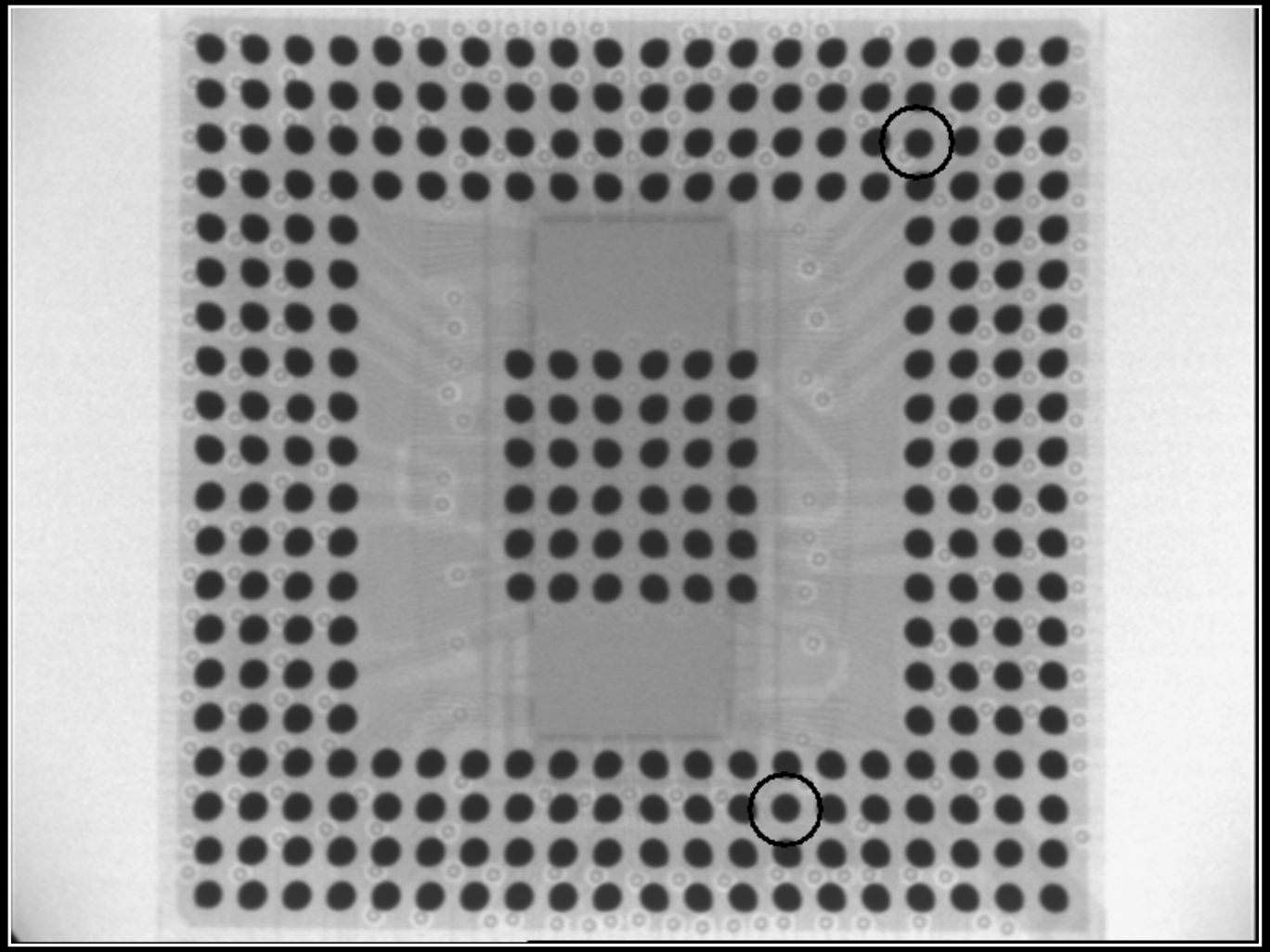
Very sensitive.

Easy to define the
pass/fail values.



BGA solder joints

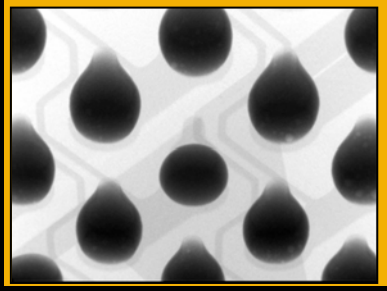
automated wetting analysis

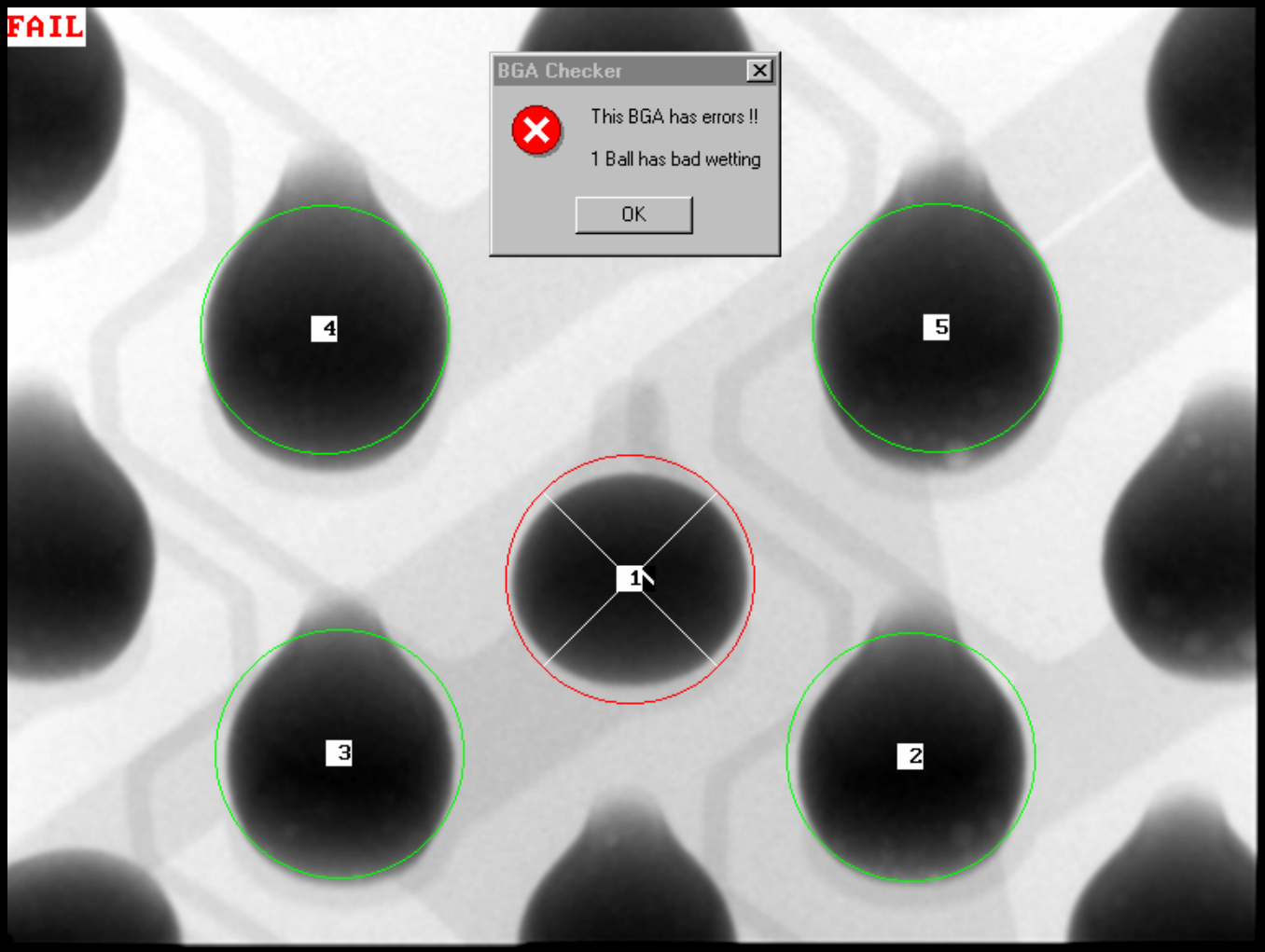


- Overview image of a BGA with wetting test pads (keyholepads). To wetting defects are present.

BGA solder joints

automated wetting analysis





- First defect: From the grey level slope (gradient) non-wetting joints can be identified in the ovhm image.

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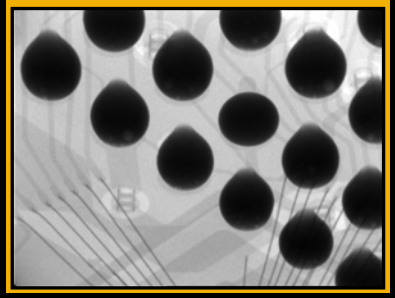
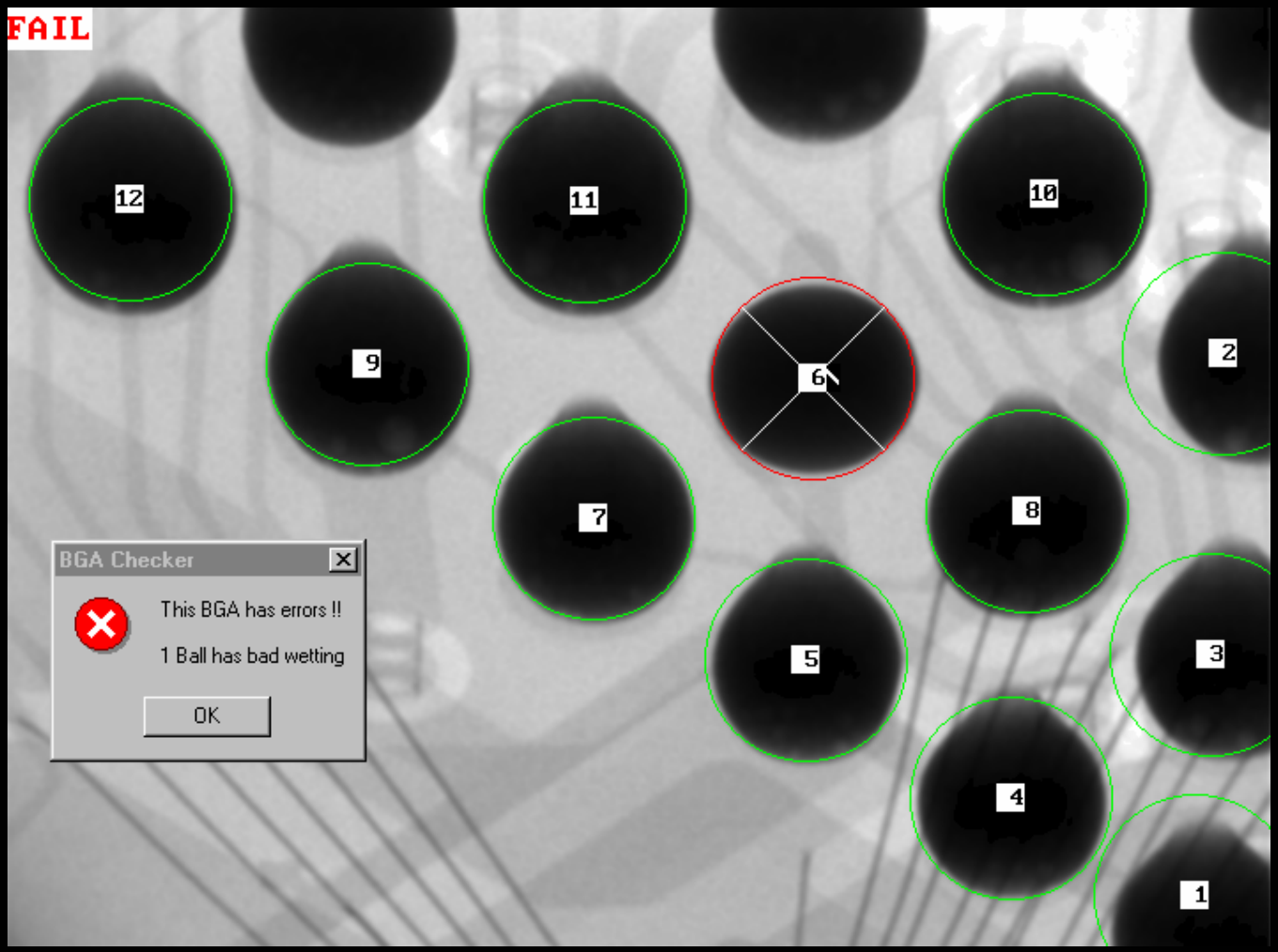
BGA solder joints

automated wetting analysis





- Second defect: From the grey level slope (gradient) non-wetting joints can be identified in the ovhm image.

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Summary:

The ovhm technology allows highest oblique view inspection

The ovhm technology gives clear information about the wetting condition

Offline and Inline

Automatic inspection

Unique technology for automatic wetting analysis

Any Question?

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