



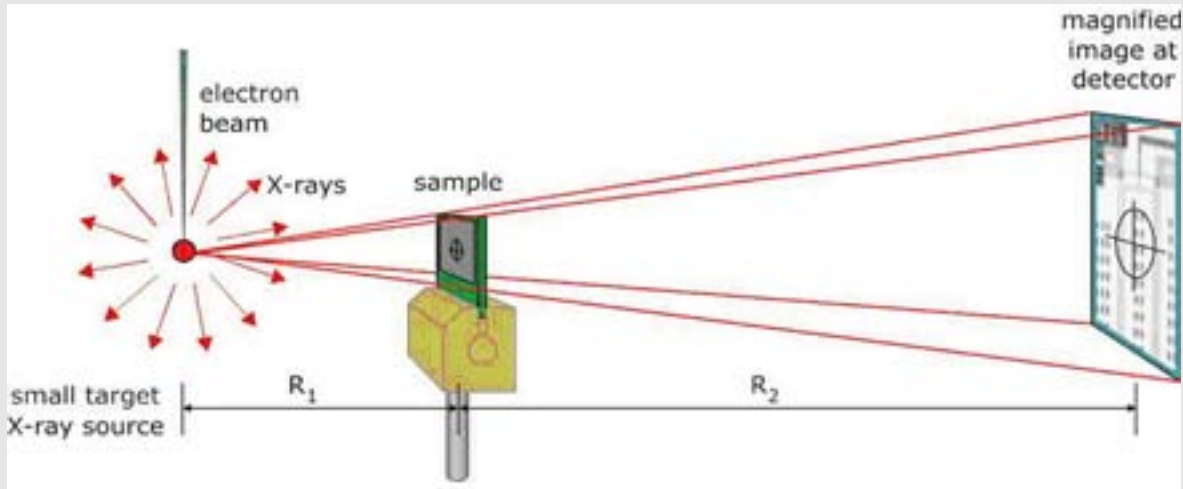
Cascade Engineering Services, Inc.

## X-Ray Applications

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# X-Ray Probing



## X-Ray Imaging

- Different material absorb X-Ray differently. Materials with different density form contrast in the imaging.

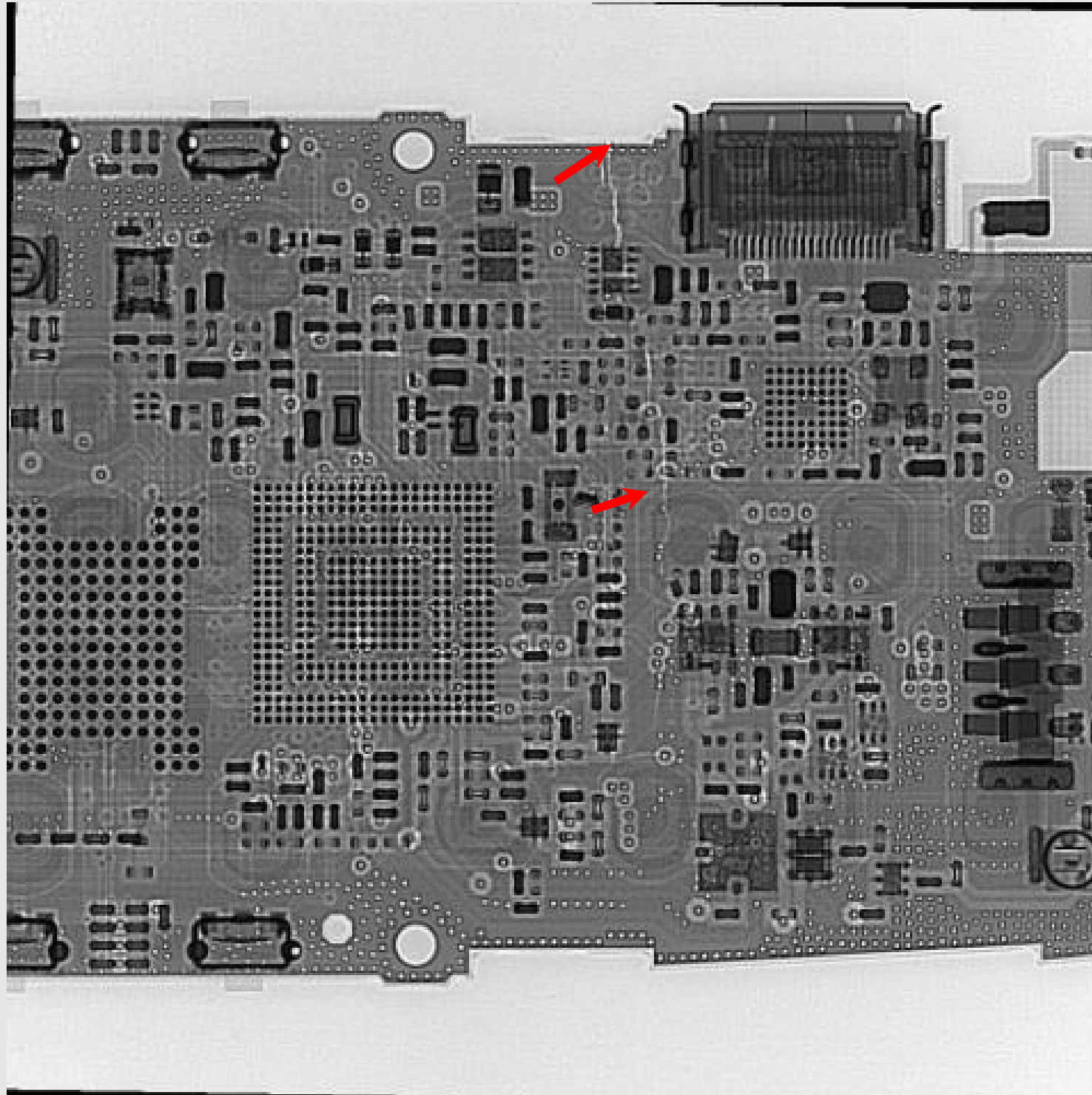
## Advantages

- No vacuum, easy sample preparation
- High penetration
- 3D reconstruction

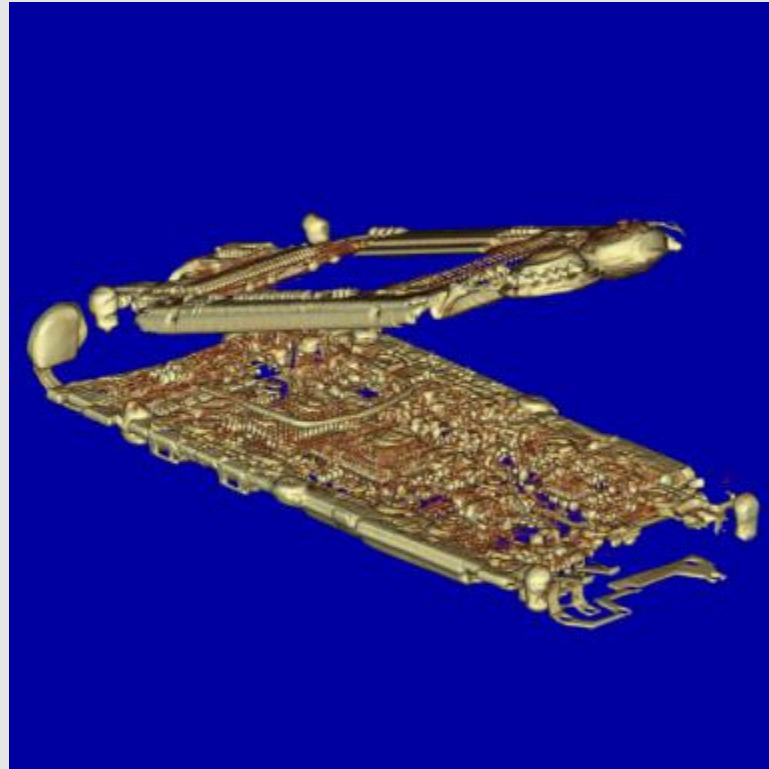
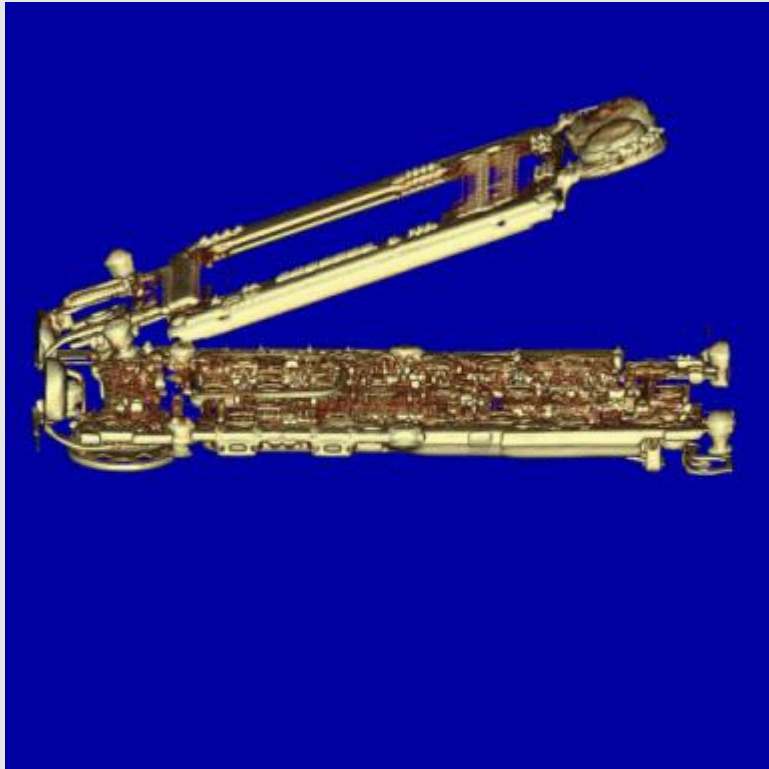
## Disadvantages

- Spatial resolution ( $\sim \mu\text{m}$ ) and Size limitations
- Quantitative analysis

# 2D X-Ray: PCBA Cracks

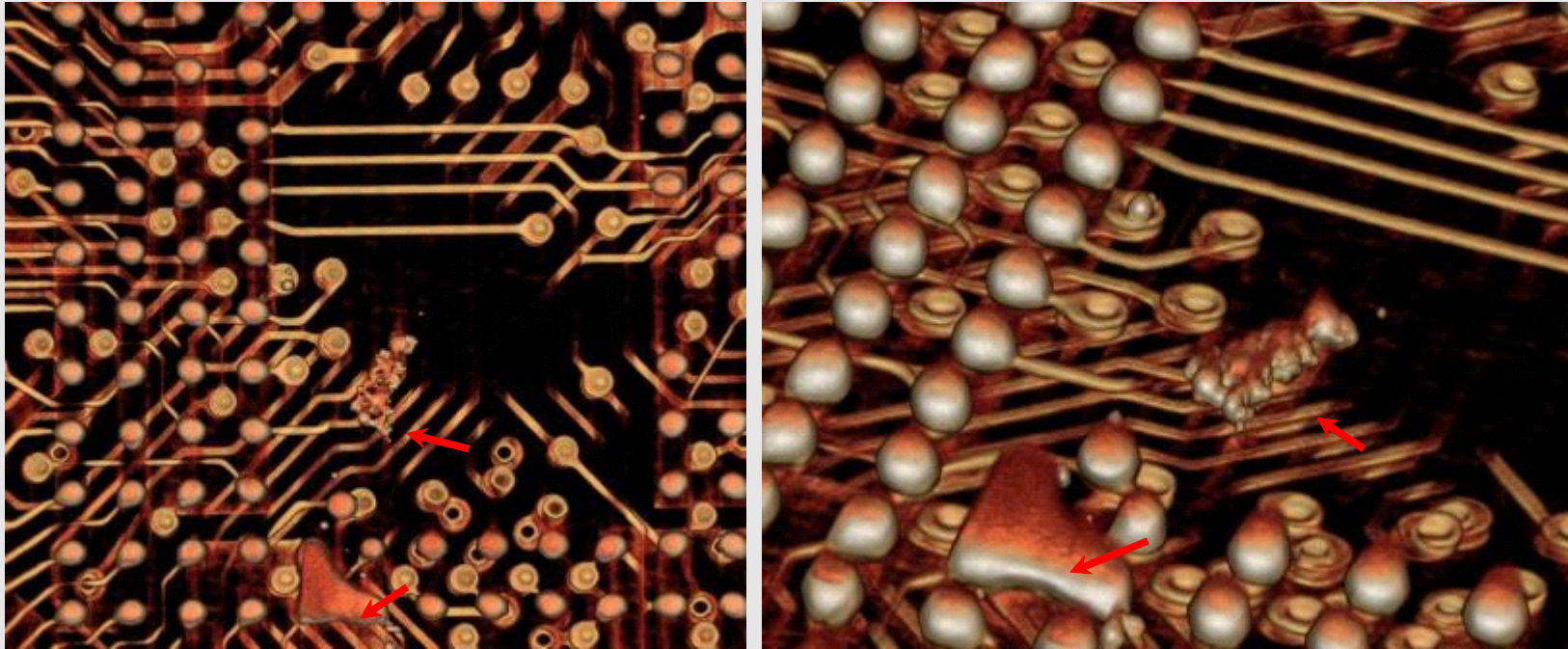


# 3D X-Ray: Image of a cell phone



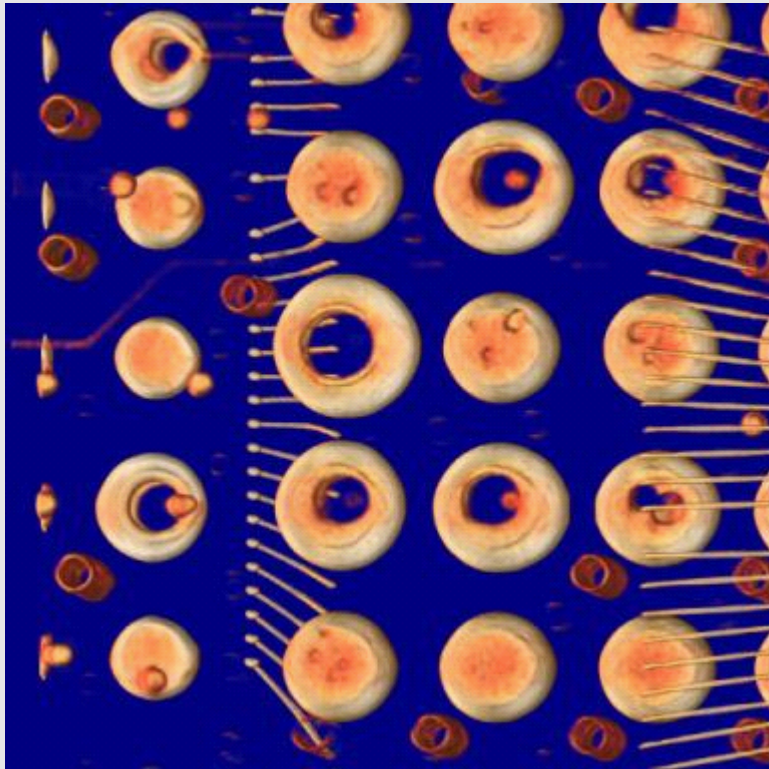
Smaller the size, better the resolution; For the same product a smaller area of interest can yield higher quality scan

# 3D X-Ray: Solder bridging and smearing

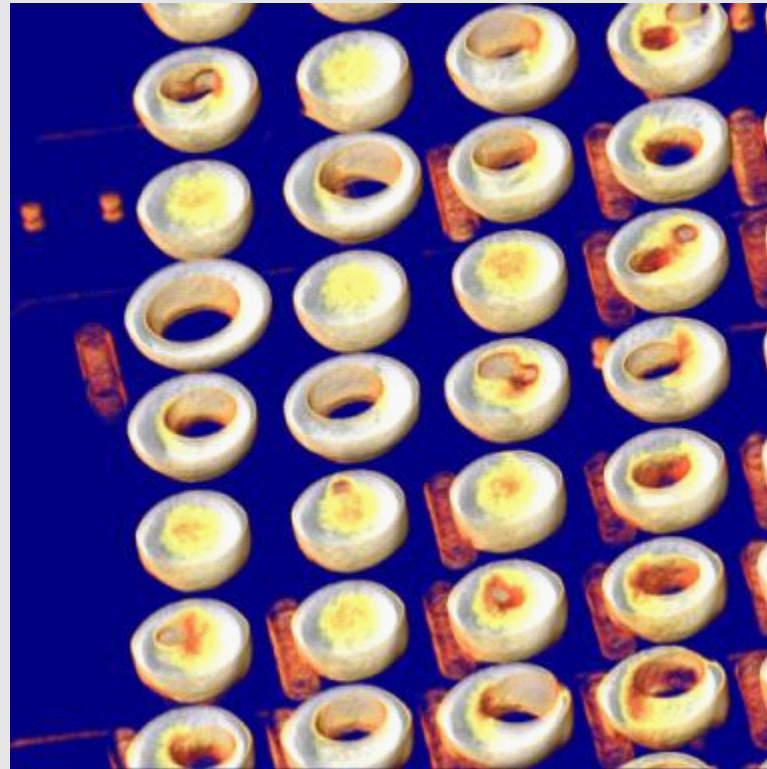


In this example, 3d non-destructive scan was useful for identifying quality and workmanship defects such as bridging and smearing of solder in a BGA package.

# 3D X-Ray: BGA Voids



Top View

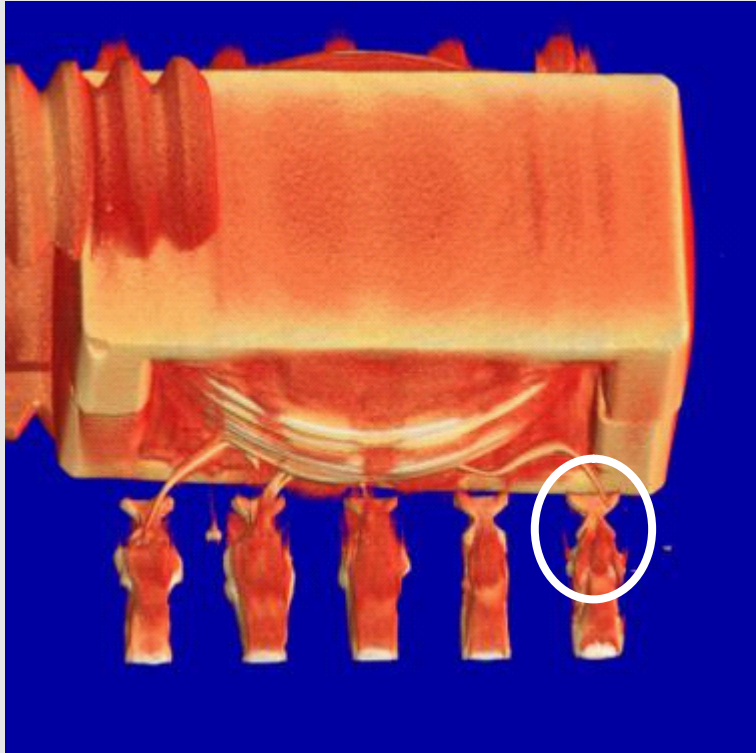


Cut Plane View

3D view of solder joints before and after virtual x-section

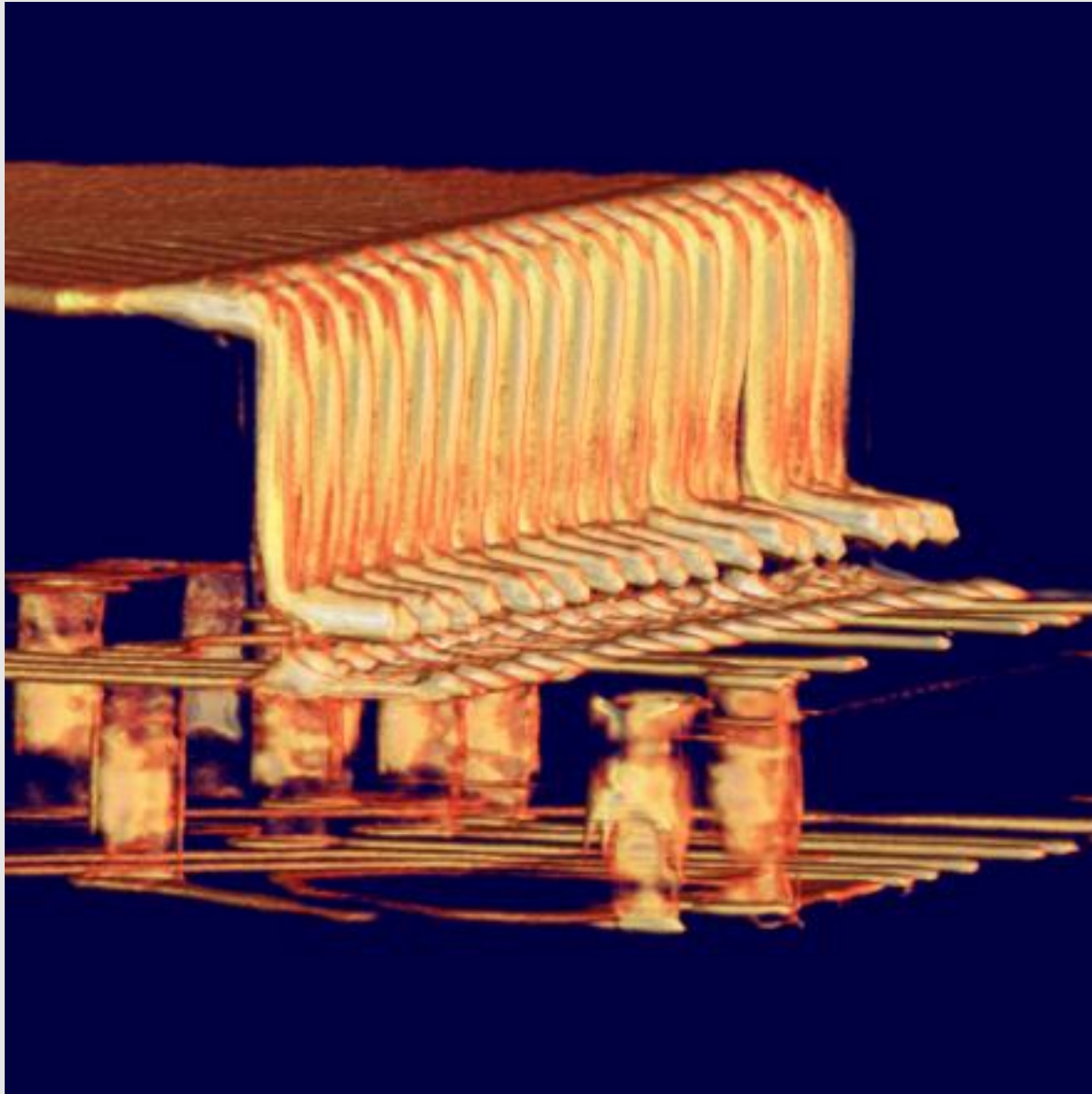
Virtual Cross-section and cut plane views offer greater flexibility in investigating defects

# 3D X-Ray: Transformer Broken Wire



In this example, 3d non-destructive scan was used to identify an internal defect such as a broken wire in a low power transformer

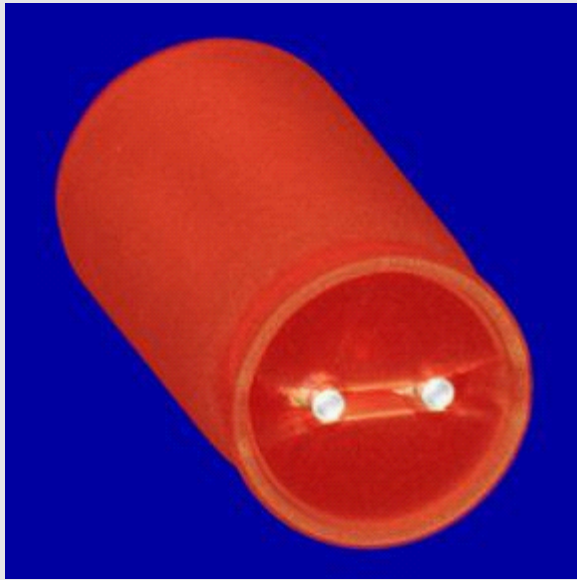
# 3D X-Ray: IC Delamination



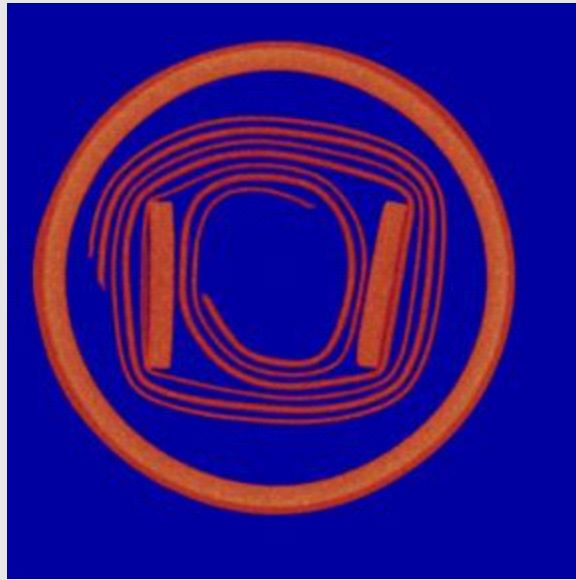
In this example, 3d non-destructive scan was used to identify IC delamination after PCBA mechanical bend test



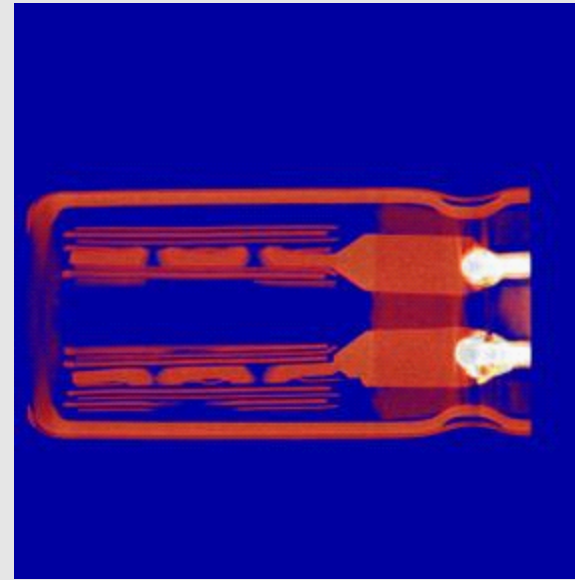
# 3D X-Ray: Capacitor Construction Analysis



Overall View



Top View



Side View

3D X-Ray enables construction analysis of good and defective components alike. In this example, 3d scan of a known good component scan was used as quality / inspection baseline.