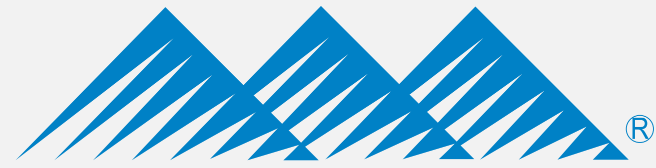


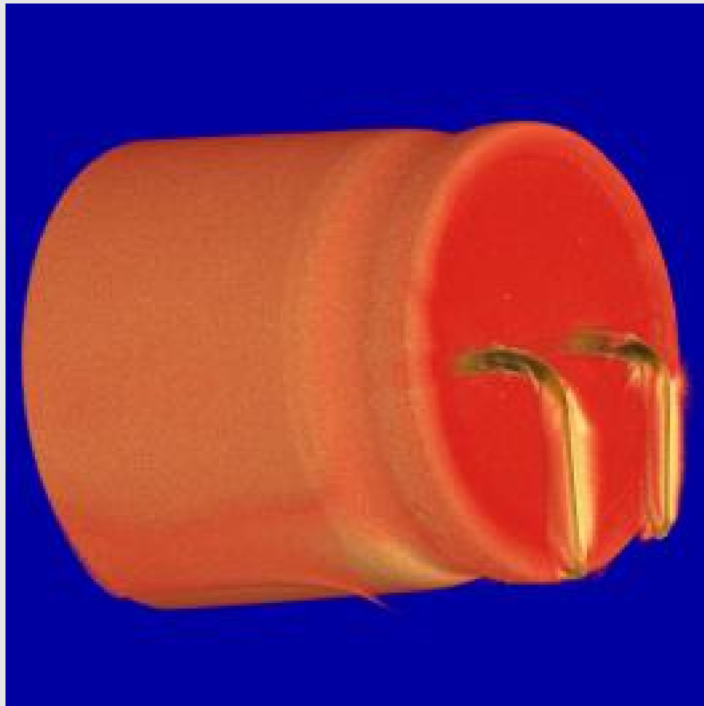
X-Ray and Electron Probing Applications

Reliability Engineering Group
Cascade Engineering Services, Inc.
6640 185th Ave NE Redmond WA 98052
(425) 895-8617 x 564

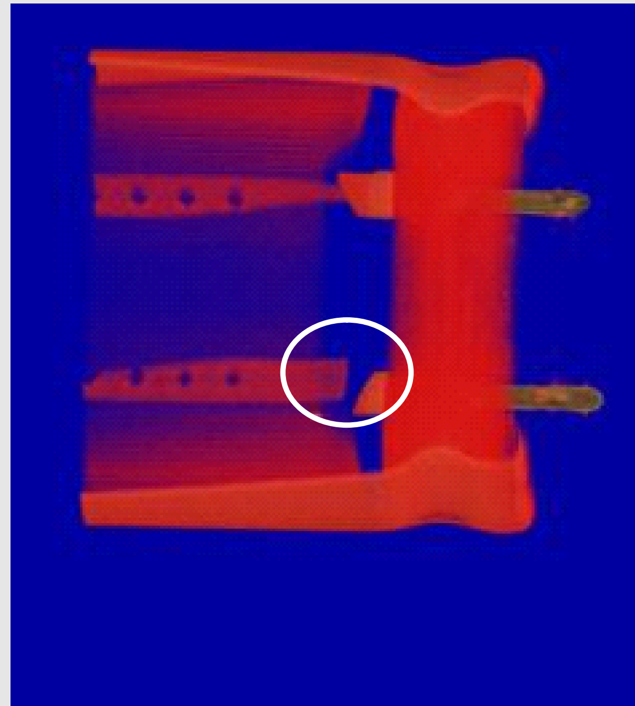
Capacitor Failure Investigation

Equipment Used

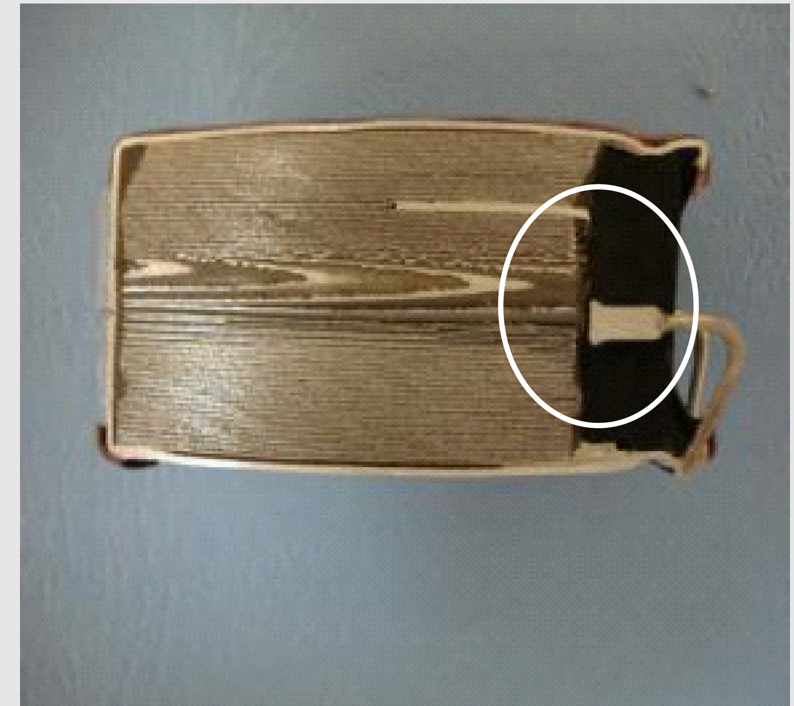
- Dye and Pry Technique



Capacitor: 3D X-Ray Image



3D X-Ray: Open Terminal observed



X-section Optical Image

Conclusions

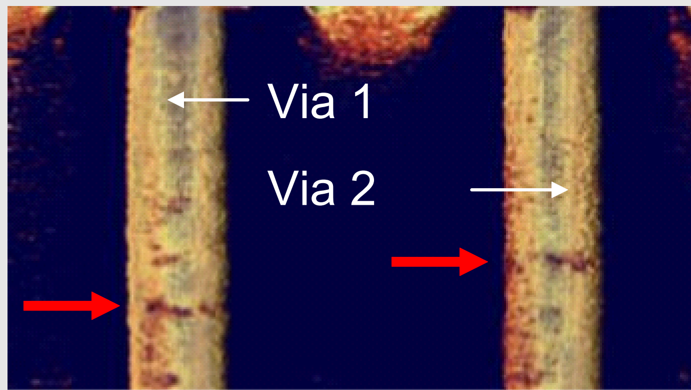
- Separation of terminal from the electrode as the failure site confirmed
- 3D X-Ray helped identify the cross-section site for further failure investigation

Cascade Engineering Services, Inc.

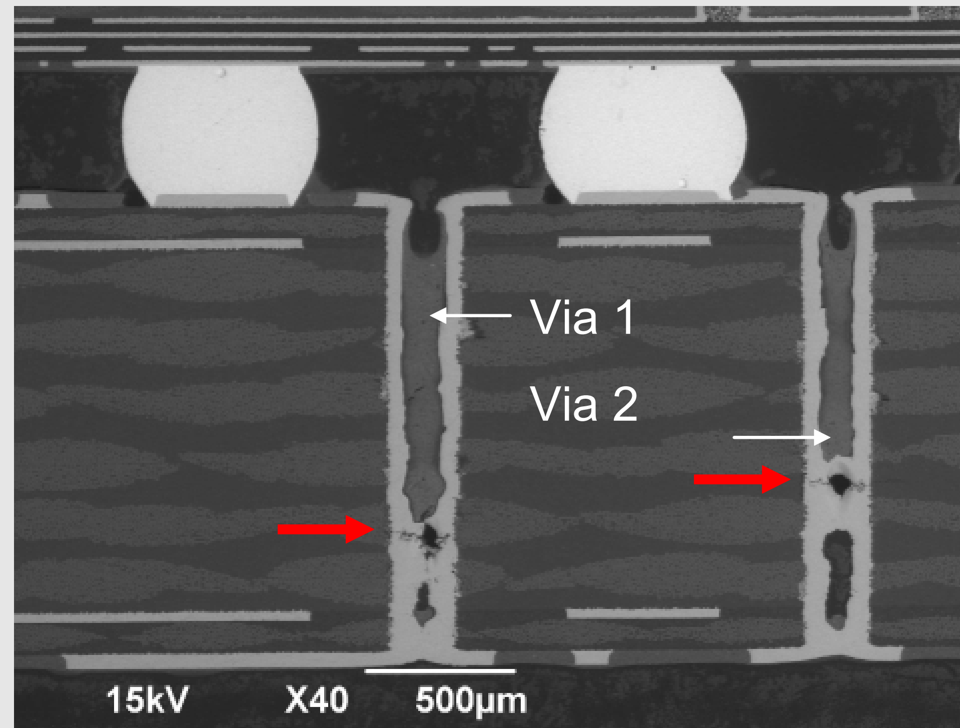
PCBA Open Trace Failure Investigation

Equipment Used

- **3D X-Ray followed by X-section / SEM**



Capacitor: 3D X-Ray Image, cross section view



3D X-Ray: Open Terminal observed

Conclusions

- **Cracks observed in both vias from X-Ray imaging confirmed by SEM**
- **3D X-Ray helped identify the cross-section site for further failure investigation**

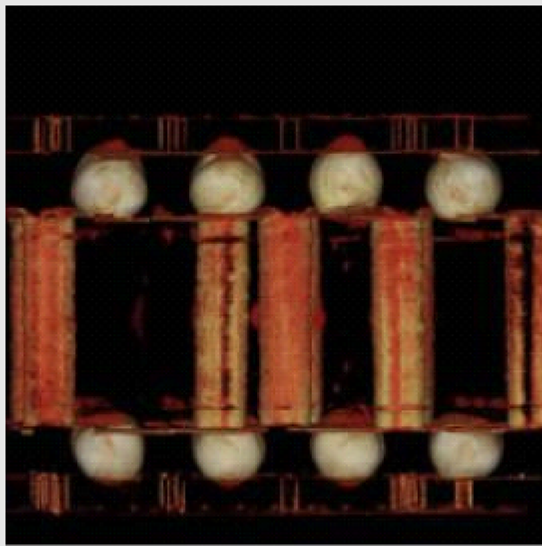
Cascade Engineering Services, Inc.

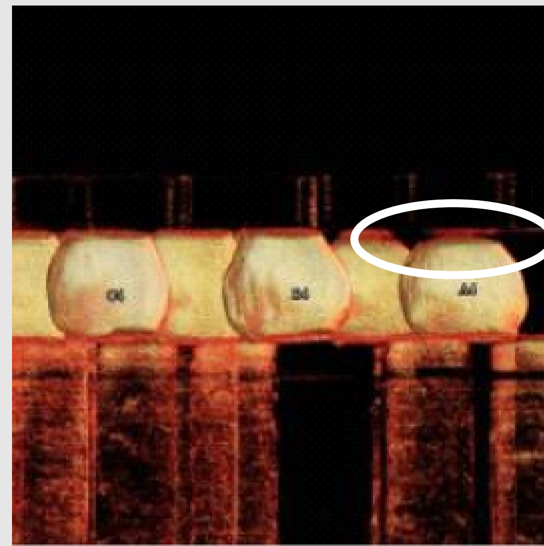
PCBA BGA Solder Joint Delamination

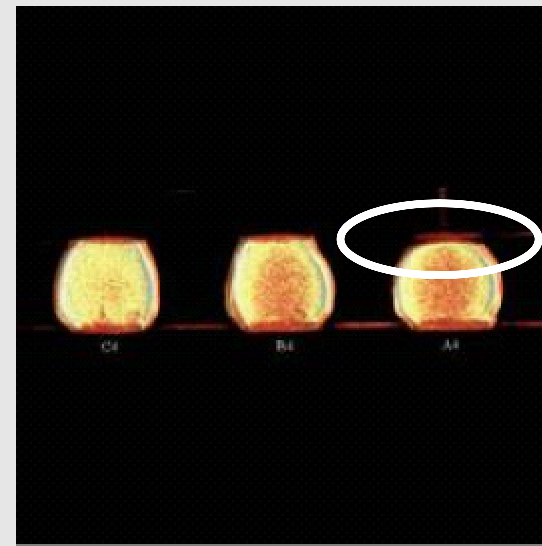
Equipment Used

- 3D X-Ray followed by X-section / SEM

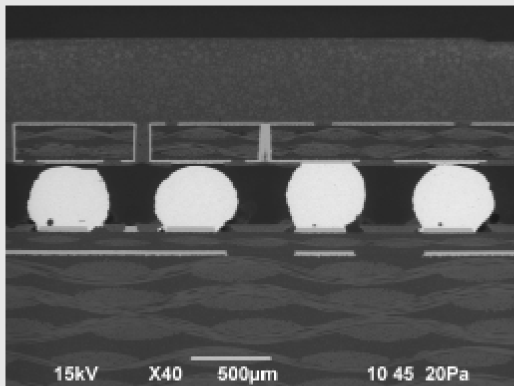
3D X-Ray Images

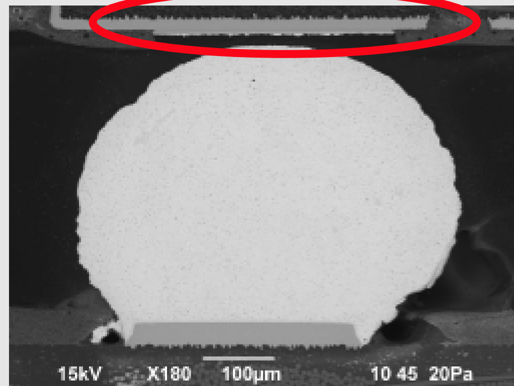


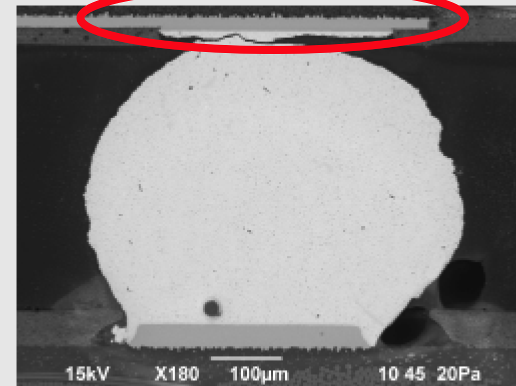




SEM Images







Conclusions

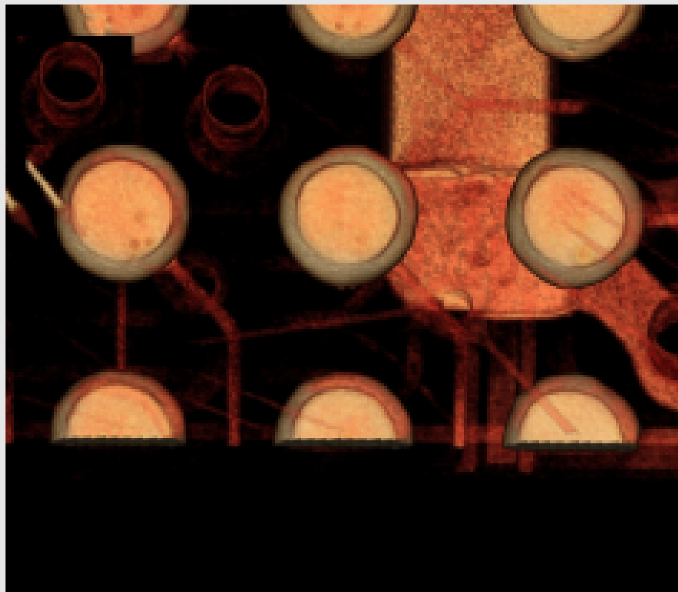
- Solder joints delamination on the chip side observed in 3D X-Ray and confirmed by SEM Imaging

PCBA BGA Solder Joint Delamination

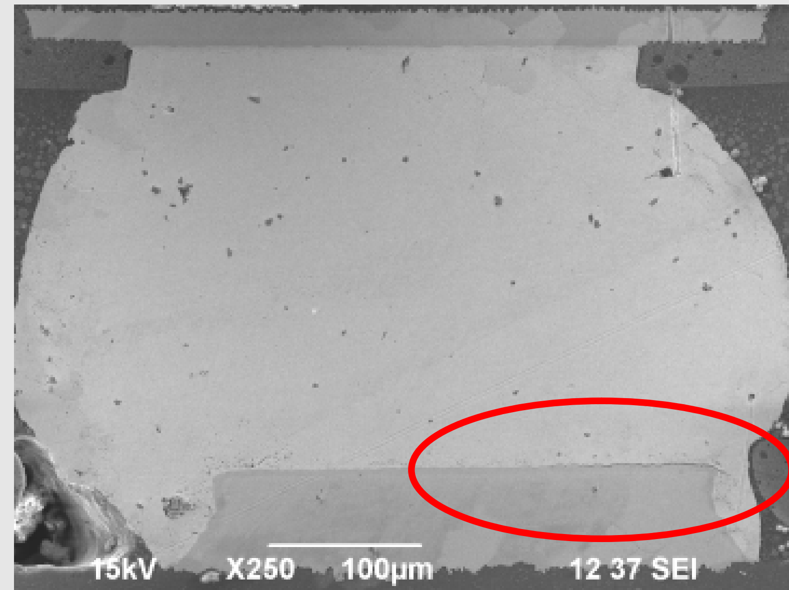
Equipment Used

- 3D X-Ray followed by X-section / SEM

3D X-Ray Image



SEM Image



Crack observed in 3D X-Ray imaging and confirmed by SEM imaging

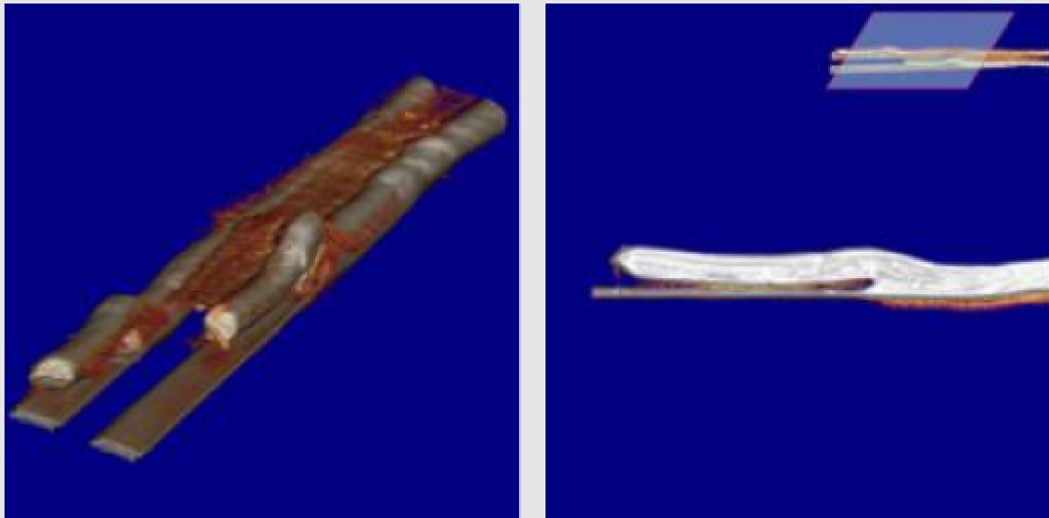
Cascade Engineering Services, Inc.

Manufacturing Defect in a Cable Connector Assembly

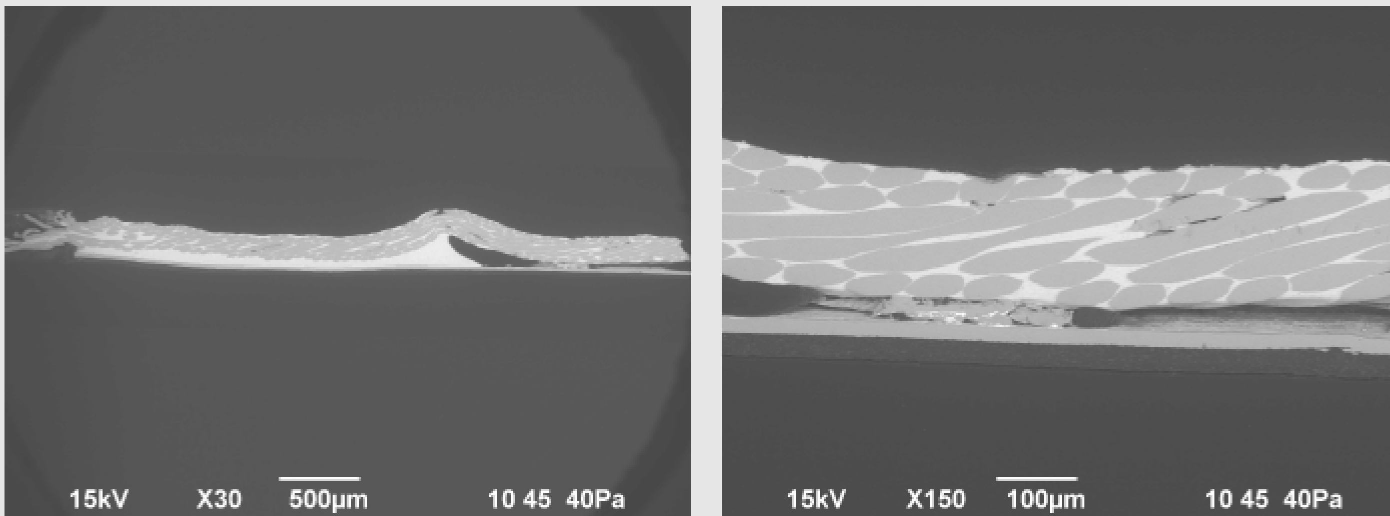
Equipment Used

- 3D X-Ray followed by X-section / SEM

3D X-Ray Images



SEM Images



Conclusions

- Insufficient soldering observed in the 3D X-Ray imaging and confirmed by SEM imaging
- Combination of techniques: useful tool for quality / inspection applications

Cascade Engineering Services, Inc.

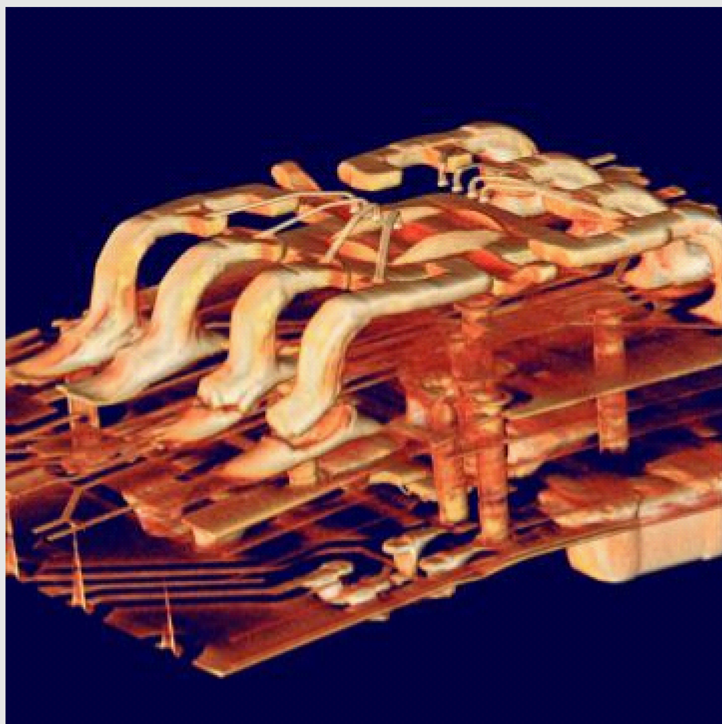
Low Power Transceiver Failure Analysis

Equipment Used

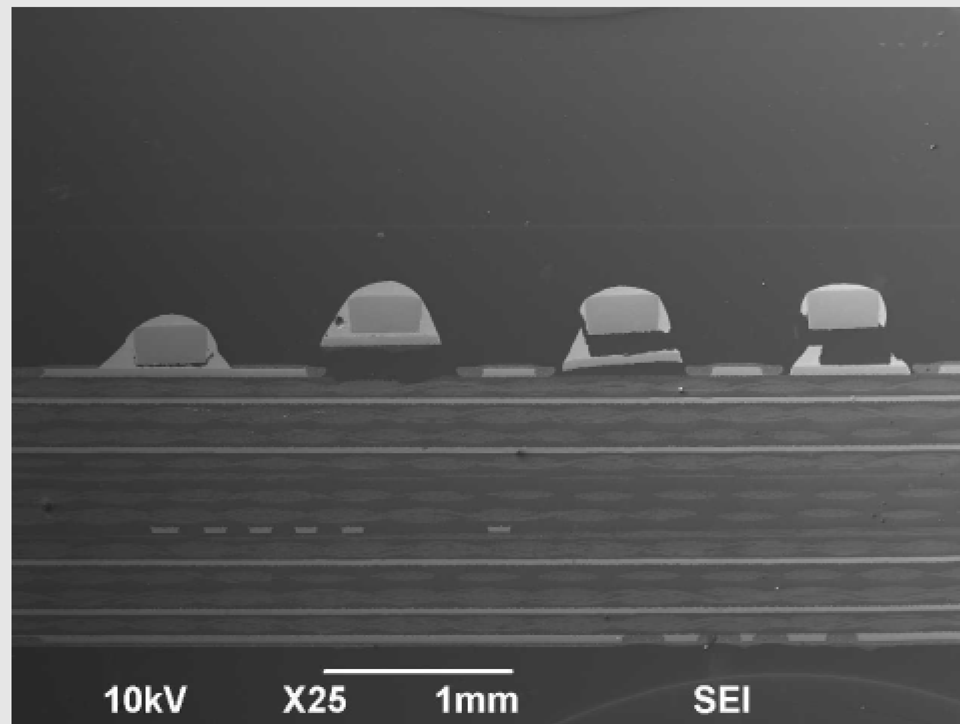
- 3D X-Ray followed by X-section / SEM

Failure Mode

- 3-pt Mechanical Bend Test



3D X-Ray Image



SEM Image after x-section

Conclusions

- Overstress failure resulting in delamination at multiple interfaces (PCBA-Bond Pad and Solder-Bond Pad
- Obvious failures-eliminating the need for one of the tools either SEM or X-Ray depending on destructive or non-destructive technique

Cascade Engineering Services, Inc.

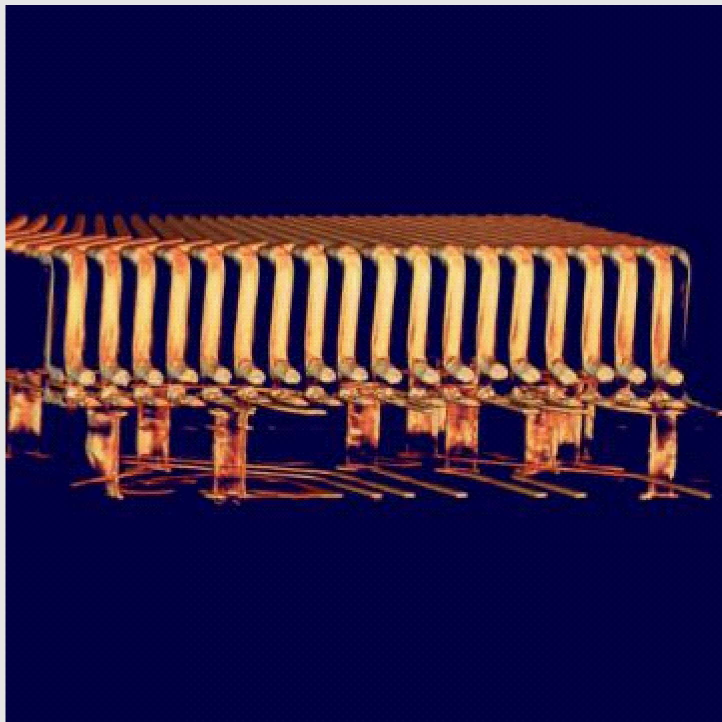
Network Interface Card Failure Analysis

Equipment Used

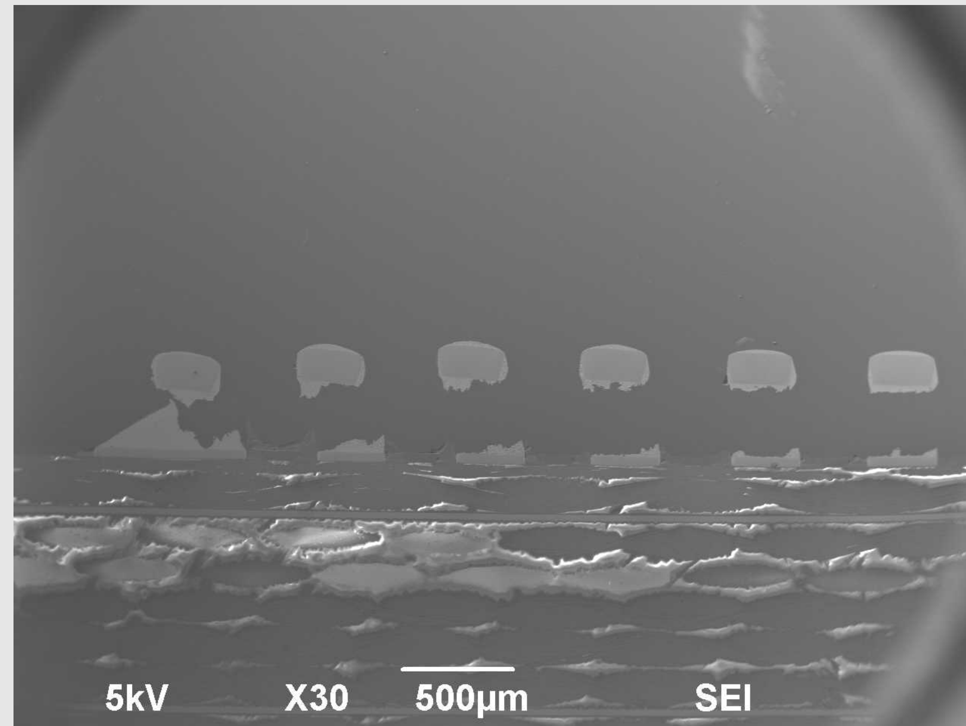
- 3D X-Ray followed by X-section / SEM

Failure Mode

- Mechanical Overstress Test



3D X-Ray Image



SEM Image after x-section

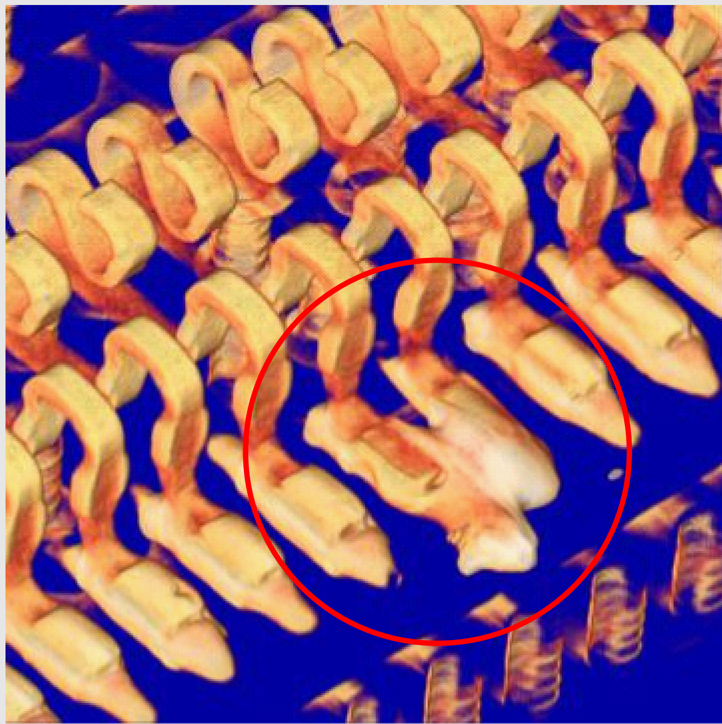
Conclusions

- Overstress failure resulting in delamination at multiple interfaces (PCBA-Bond Pad and Solder-Bond Pad
- Obvious failures-eliminating the need for one of the tools either SEM or X-Ray depending on destructive or non-destructive technique

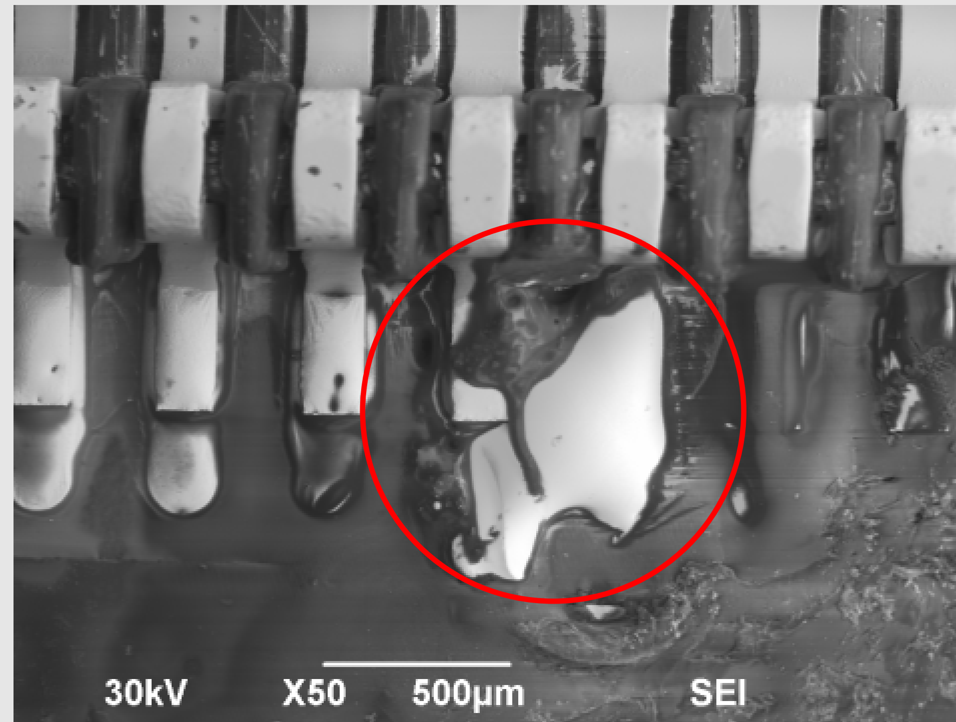
Quality Inspection of a Cell Phone Cable Connector

Equipment Used

- 3D X-Ray followed by X-section / SEM



3D X-Ray Image



SEM Image after x-section

Conclusions

- Bridging of joints – highlighting the importance of 3D X-Ray as a quick and effective inspection tool

Cascade Engineering Services, Inc.

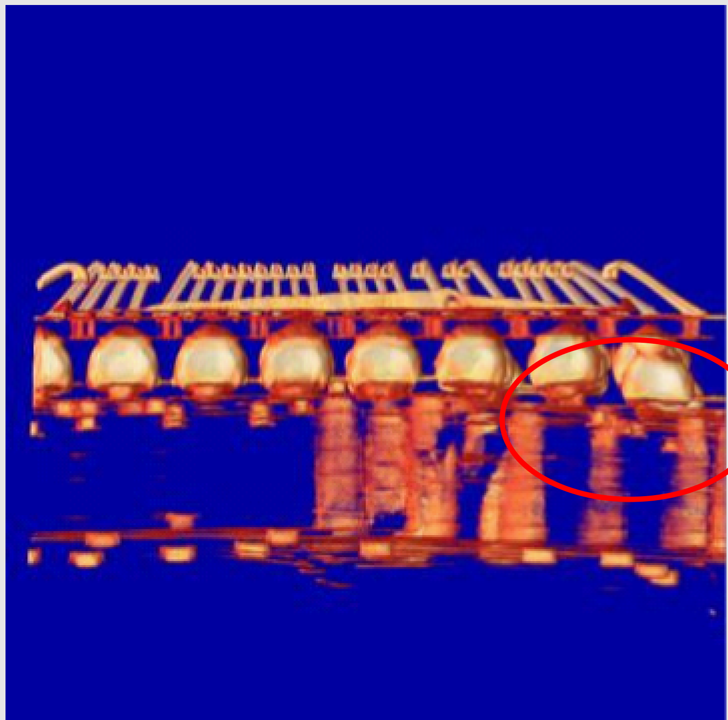
Cell Phone PCBA CPU Failure Analysis

Equipment Used

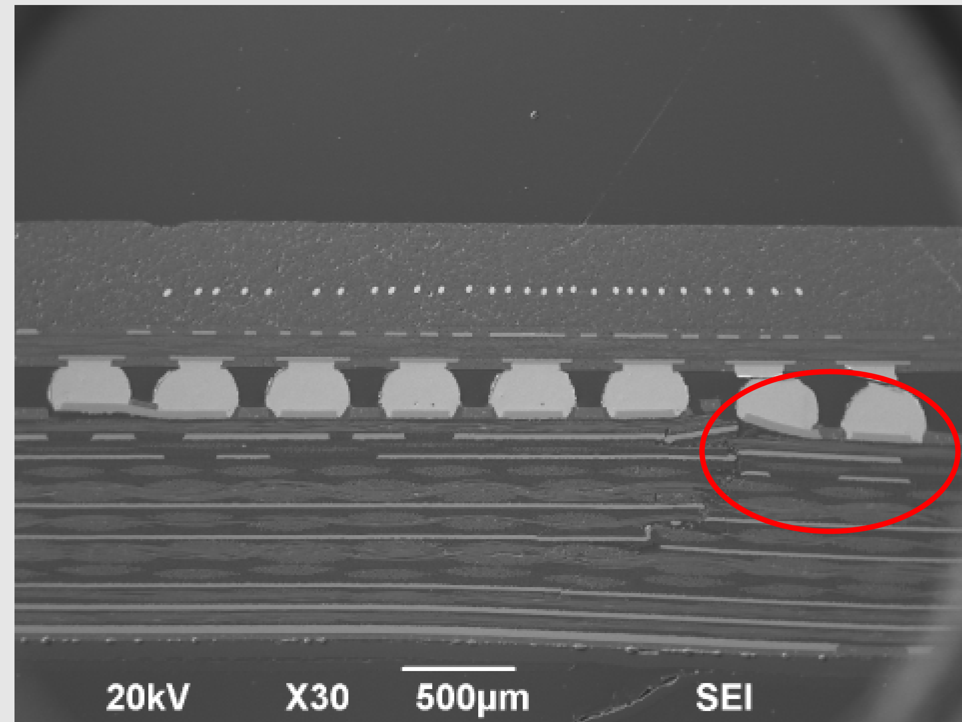
- 3D X-Ray followed by X-section / SEM

Failure Mode

- Mechanical Bend Test



3D X-Ray Image



SEM Image after x-section

Conclusions

- Overstress failure resulting in delamination at multiple interfaces (PCBA-Bond Pad and Solder-Bond Pad
- Failure confirmation from X-Ray eliminates the need for SEM if non-destructive technique is called for

Cascade Engineering Services, Inc.

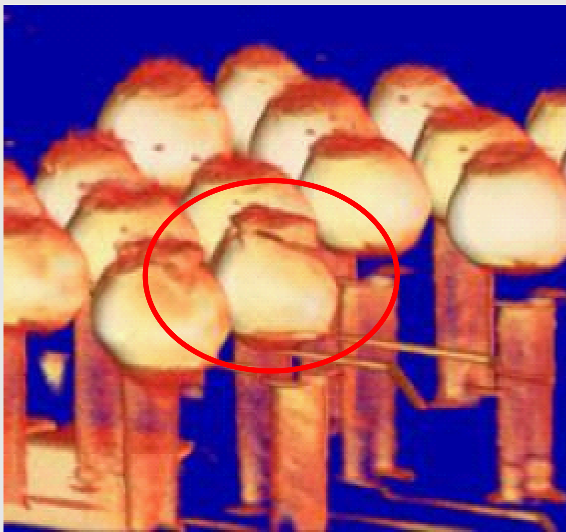
Cell Phone PCBA CPU Failure Analysis

Equipment Used

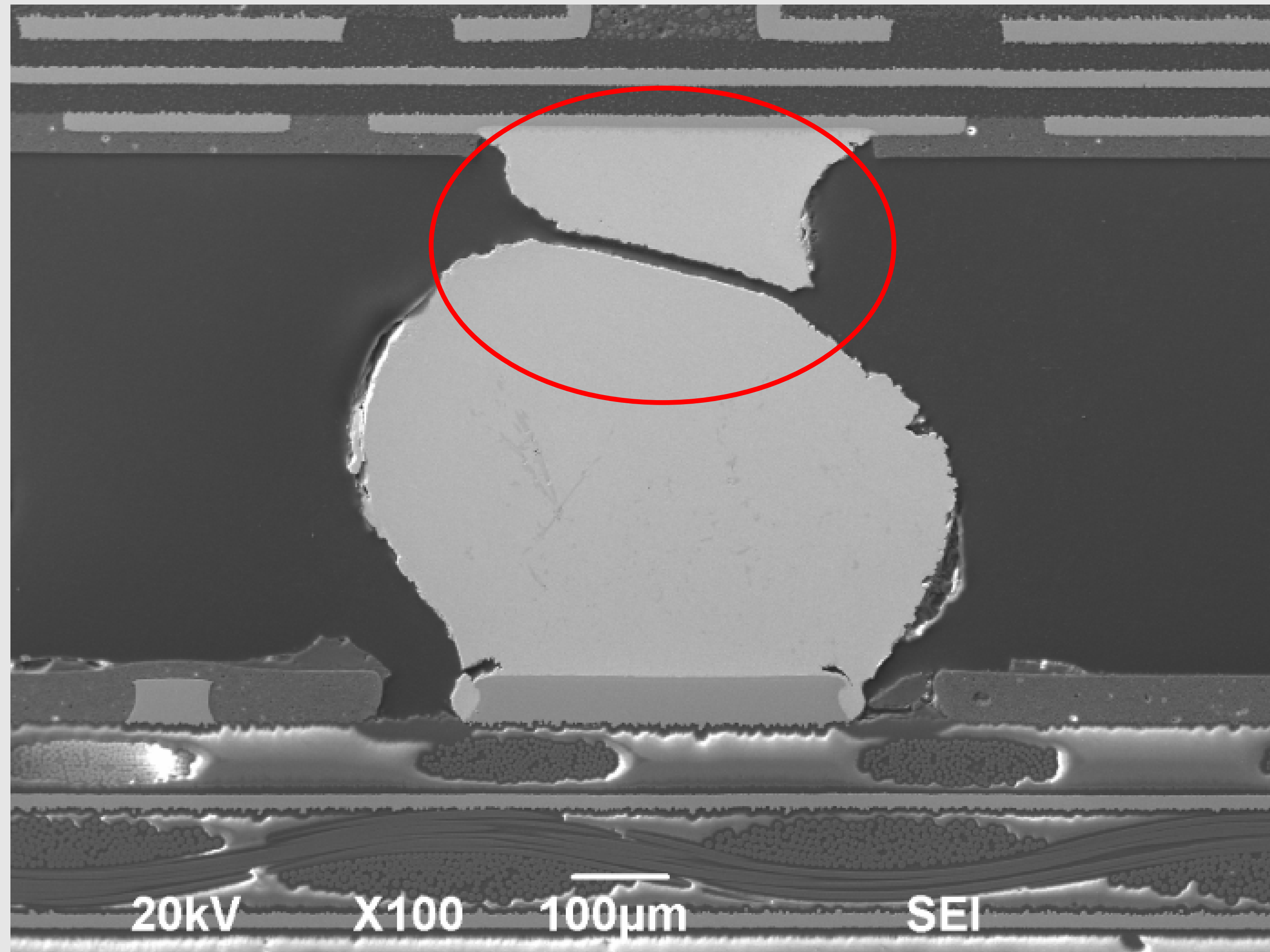
- 3D X-Ray followed by X-section / SEM

Failure Mode

- Mechanical Bend Test



3D X-Ray Image



SEM Image after x-section