DfR Solutions

reliability designed, reliability delivered

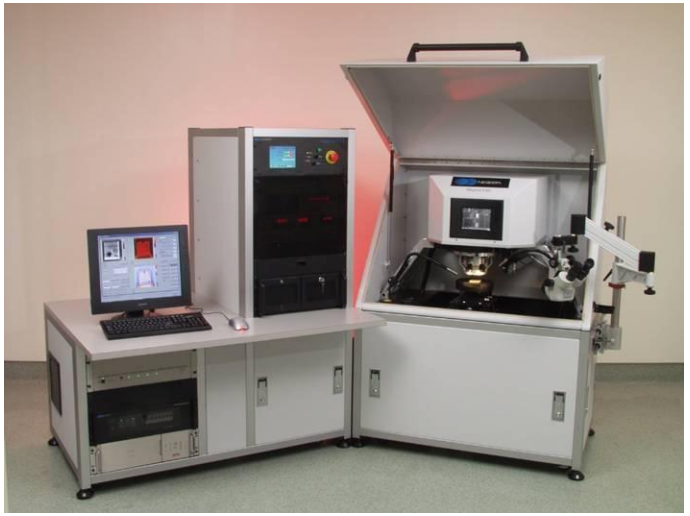
SQUID - Superconducting Quantum Interference Device

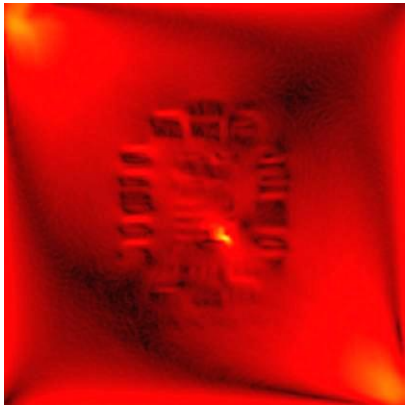
Cheryl Tulkoff

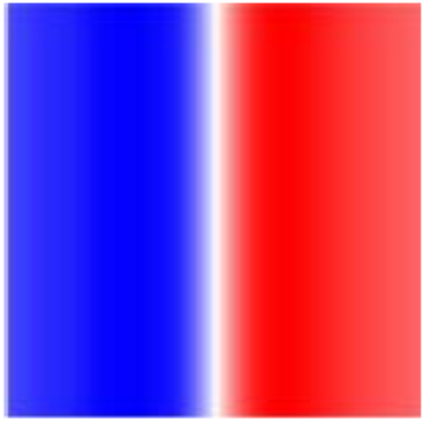
February 7, 2014

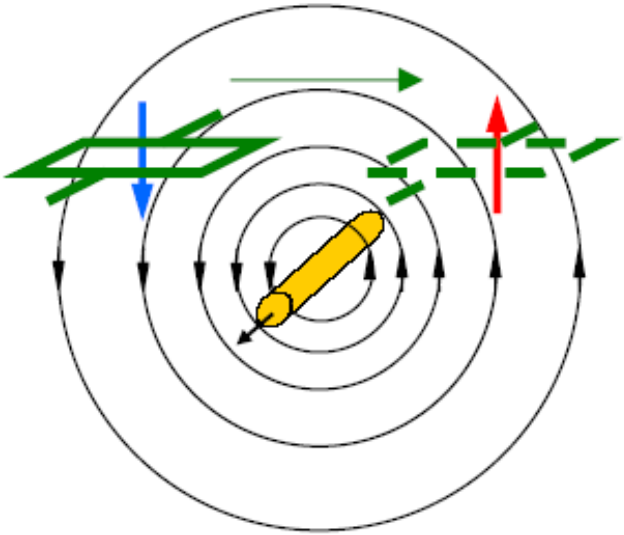
SQUID Microscopy

- Current flow in devices produce a magnetic field
  - SQUID uses a highly sensitive magnetic detector (superconductor) to resolve these fields
  - Magnetic field image is converted to a current density image, allowing for fault location
- Resolution
  - 500 nA, 300 nm
  - Dependent on working distance (requires a flat sample)







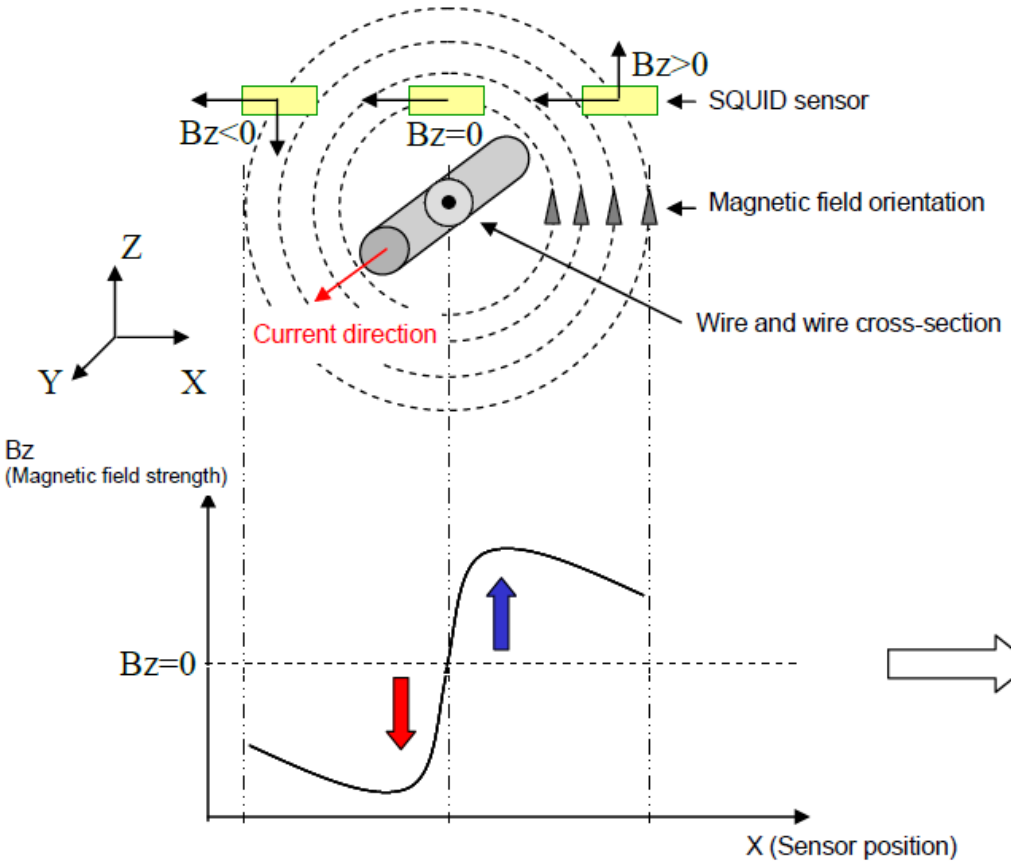


DfR Solutions

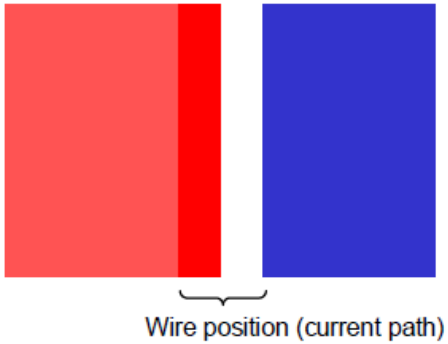
5110 Roanoke Place, Suite 101, College Park, MD 20740 | 301-474-0607 | www.dfrsolutions.com

SQUID Microscopy

The SQUID sensor acquires the magnetic field strength and plots it on a graph.
The magnetic field strength is zero in the Z direction directly above the wire.
The magnetic field strength Bz is simulated using color.
Blue is displayed when magnetic field strength Bz > 0, and red when Bz < 0.



Detection of Magnetic Field Strength from a Wire



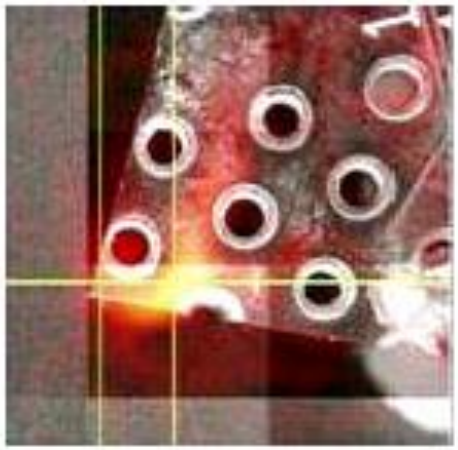
Graphical Presentation of Magnetic Field

Images Courtesy of Sony

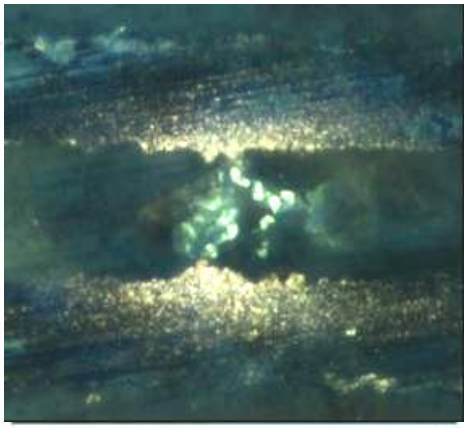
5110 Roanoke Place, Suite 101, College Park, MD 20740 | 301-474-0607 | www.dfrsolutions.com

SQUID Microscopy

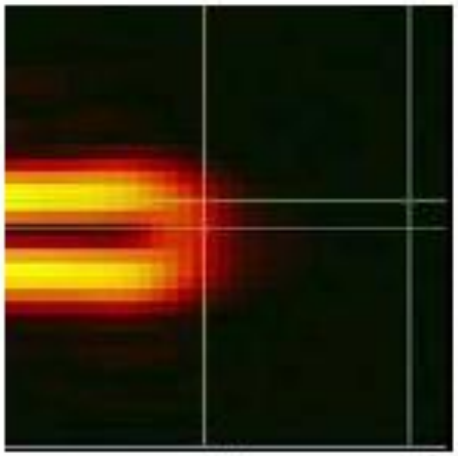
- Critical technology for detecting package level electrical shorts
  - Much more rapid failure site resolution
  - Absolute confirmation of shorting path
  - Thermal imaging induces damage



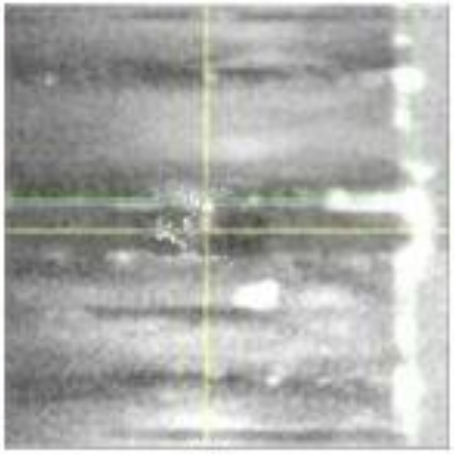
(a)



(b)



(c)

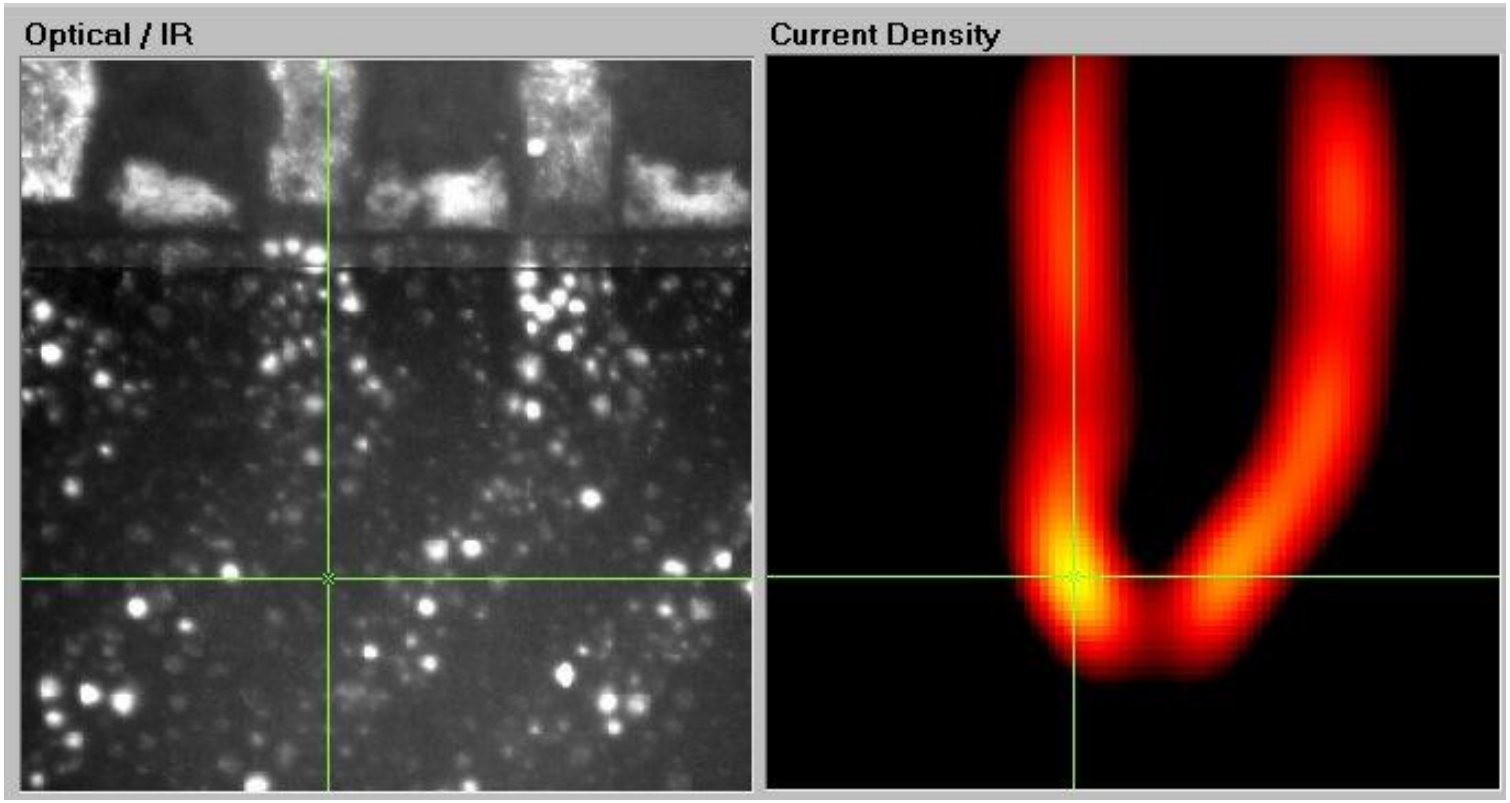


(d)

DfR Solutions

5110 Roanoke Place, Suite 101, College Park, MD 20740 | 301-474-0607 | www.dfrsolutions.com

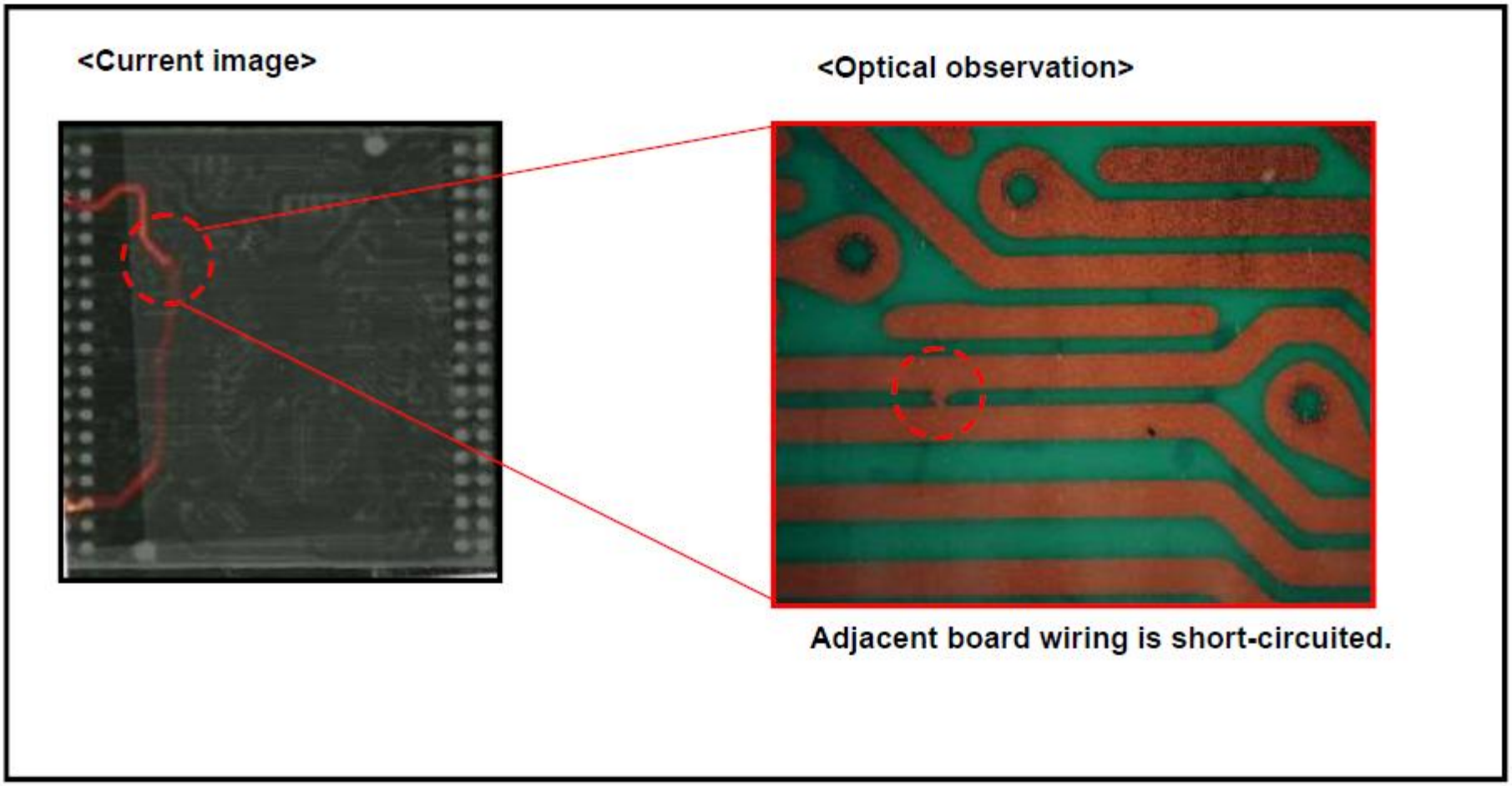
SQUID Microscopy



- Extremely effective in locating failure site

Scanning SQUID Microscopy to Detect Foreign Matter

- Images Courtesy of Sony



5110 Roanoke Place, Suite 101, College Park, MD 20740 | 301-474-0607 | www.dfrsolutions.com

Disclaimer & Confidentiality

- **ANALYSIS INFORMATION**

  This report may include results obtained through analysis performed by DfR Solutions' Sherlock software. This comprehensive tool is capable of identifying design flaws and predicting product performance. For more information, please contact DfRSales@dfrsolutions.com.

- **DISCLAIMER**

  DfR represents that a reasonable effort has been made to ensure the accuracy and reliability of the information within this report. However, DfR Solutions makes no warranty, both express and implied, concerning the content of this report, including, but not limited to the existence of any latent or patent defects, merchantability, and/or fitness for a particular use. DfR will not be liable for loss of use, revenue, profit, or any special, incidental, or consequential damages arising out of, connected with, or resulting from, the information presented within this report.

- **CONFIDENTIALITY**

  The information contained in this document is considered to be proprietary to DfR Solutions and the appropriate recipient. Dissemination of this information, in whole or in part, without the prior written authorization of DfR Solutions, is strictly prohibited.

From all of us at DfR Solutions, we would like to thank you for choosing us as your partner in quality and reliability assurance. We encourage you to visit our website for information on a wide variety of topics.

Best Regards,
Dr. Craig Hillman, CEO

DfR Solutions

5110 Roanoke Place, Suite 101, College Park, MD 20740 | 301-474-0607 | www.dfrsolutions.com