IEEE SW Test Workshop

Semiconductor Wafer Test Workshop

SWTW

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Hybrid Wafer Testing Probe Card

SCANIMETRICS

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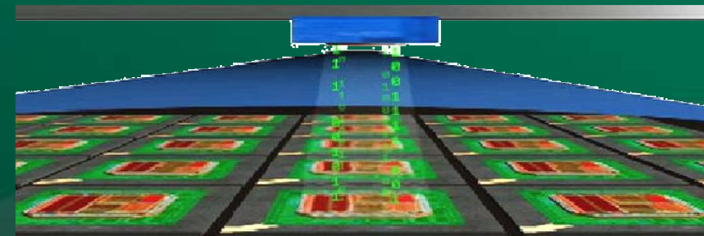
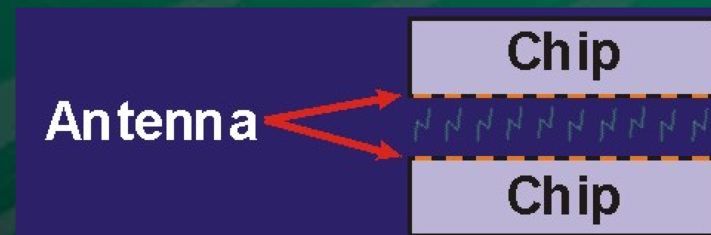
Overview

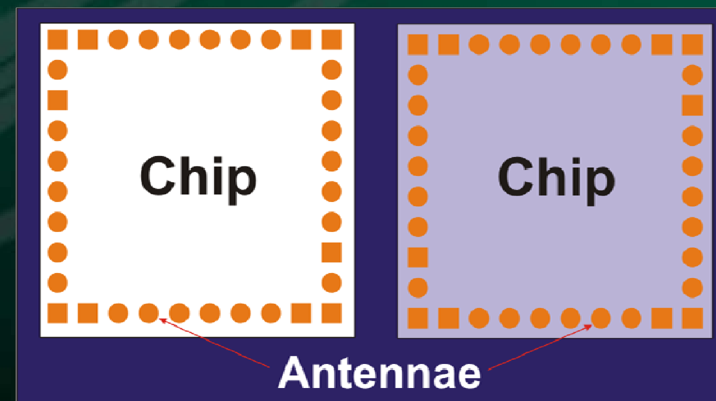
- Existing Issues
- Contact Damage Challenge
- Wireless (Non-contact) for Data
- Contact Probes for Power
- DUT Power + Non-contact Data Solution
- Summary

The Technology

- Wireless chip-scale communications
- Distances < 100 µm
- Micro TX/RX on chip
- One TX/RX per I/O
- Fully CMOS compatible
- Power transfer also possible
- Pitch scales to <20um
- No impact on real estate for most applications
- Data scales to 8 Gbps







Our Advantage

- Scanimetrics' technology is "non-contact"
  - manufacturing process can be monitored
  - chips can be smaller
  - more chips can be tested at once
- Test can be performed where no test was possible before

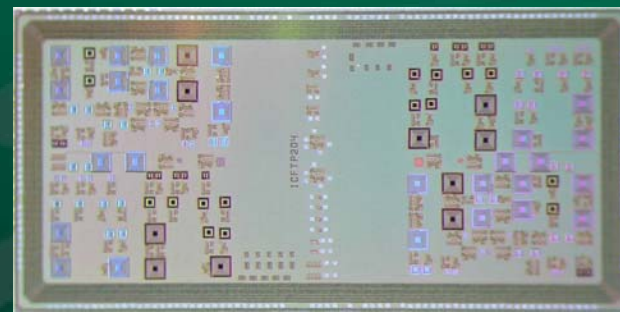
Chips are less expensive and production is more efficient

Technical Progress

- 3 recent designs in silicon
  - 0.18um Test Chip
  - 0.13um Wireless JTAG interface
  - 0.13um SiP Wireless Test Access Port
- Expanding into new application areas

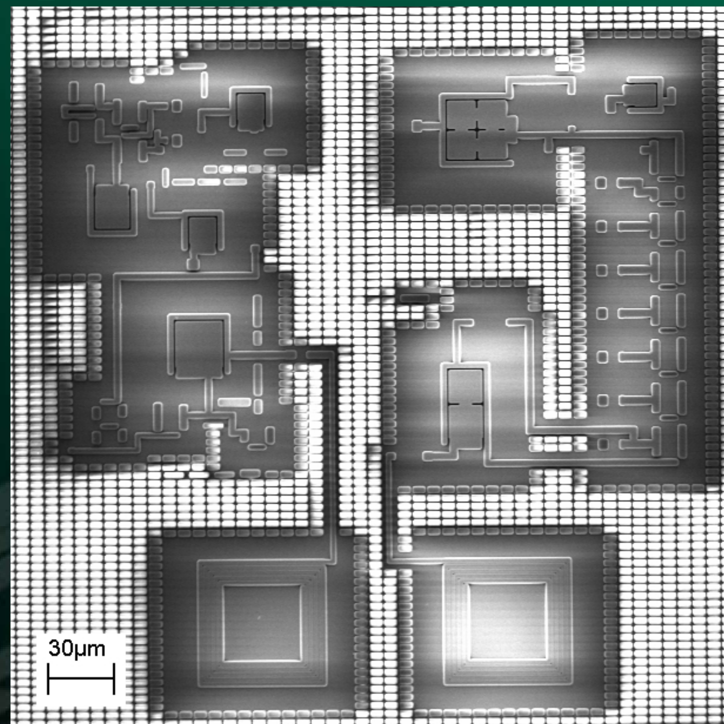
Test Chip

- Fully integrated CMOS design (0.18 µm)
- Antenna dimensions of 60 – 280 µm
- Antenna feature sizes of 1.5 µm
- Demonstrate that the technology can be integrated into an existing CMOS IC I/O cell
- Prove that RF signals do not effect on-chip performance
- Demonstrate that signal integrity at test speeds is maintained
- Demonstrate intelligent probe card capabilities

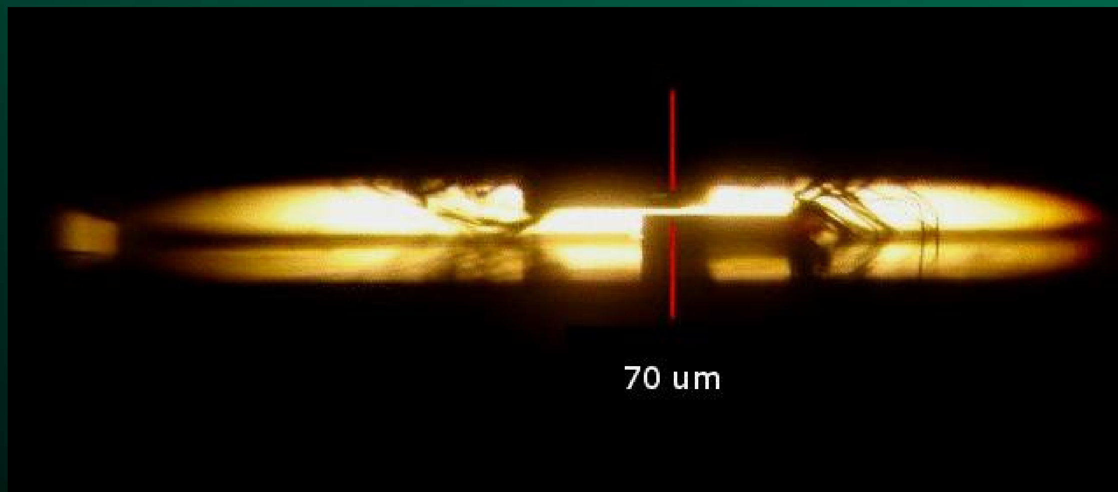


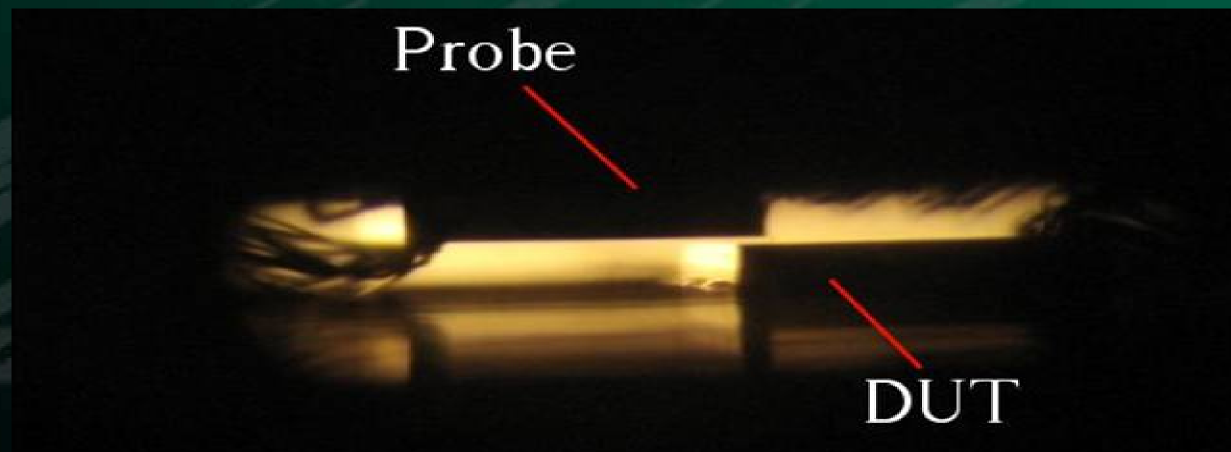
Micrograph

Transceivers with Antennae



Chip-to-Chip Communication

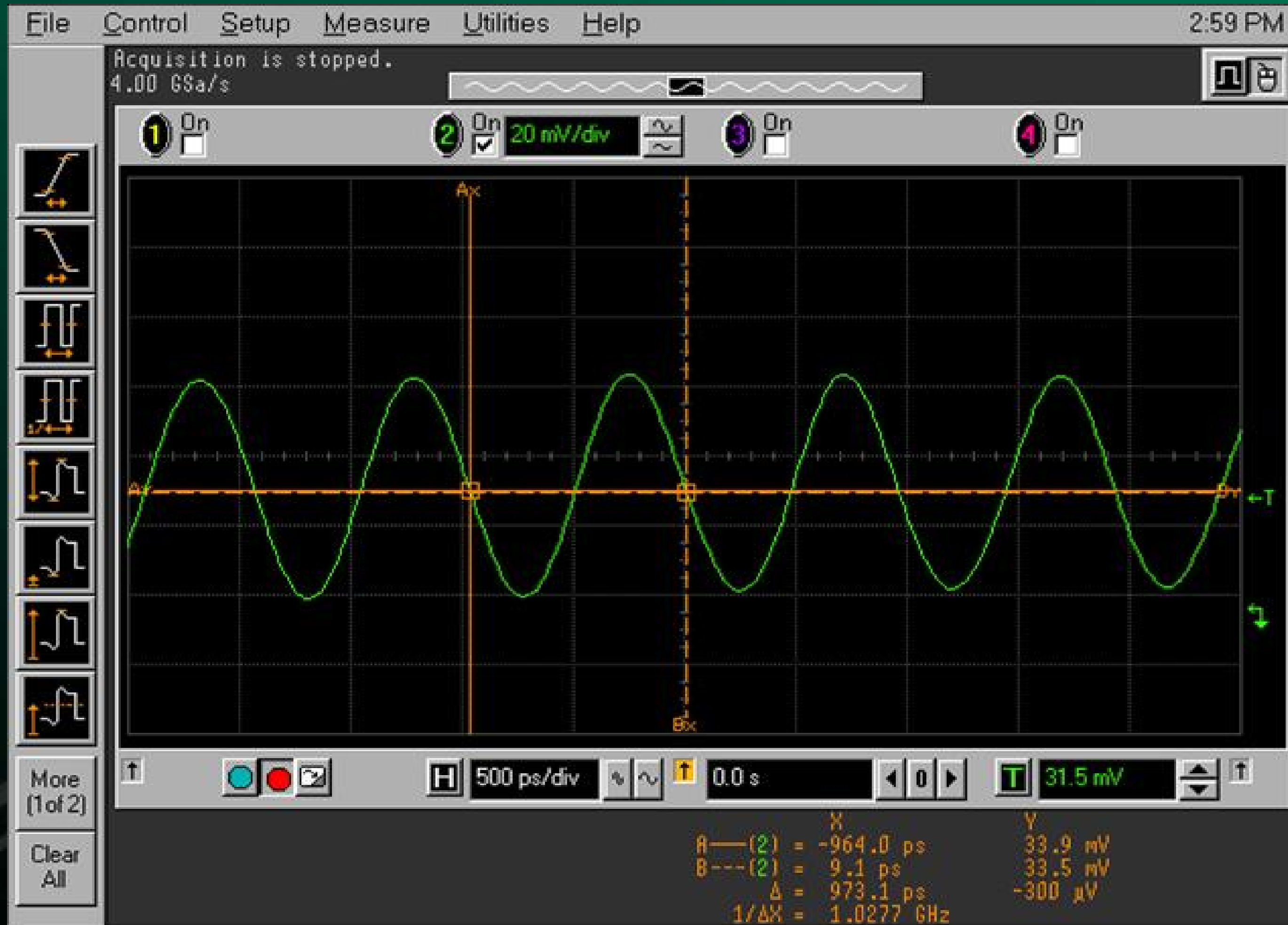




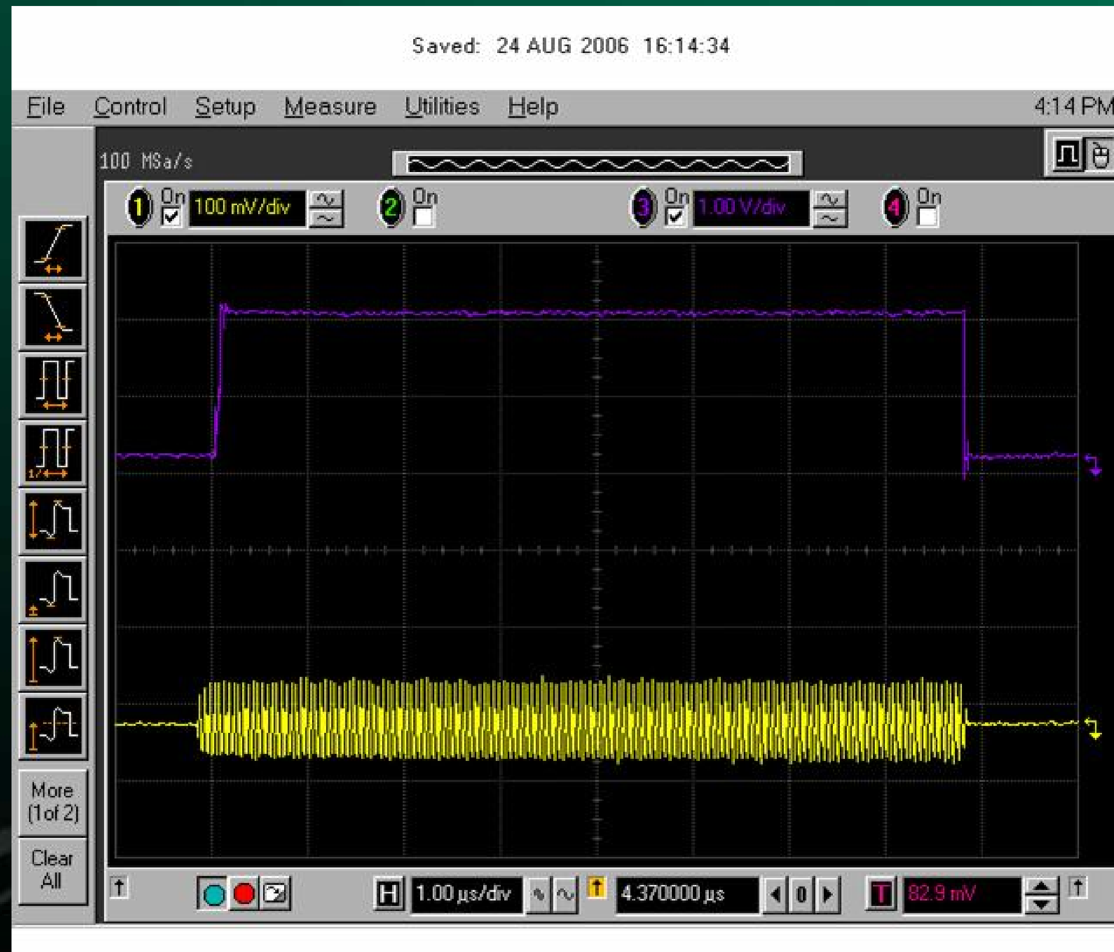
Wireless Test Interface

E.G. Non-contact JTAG enquiry and response

GHz Carrier



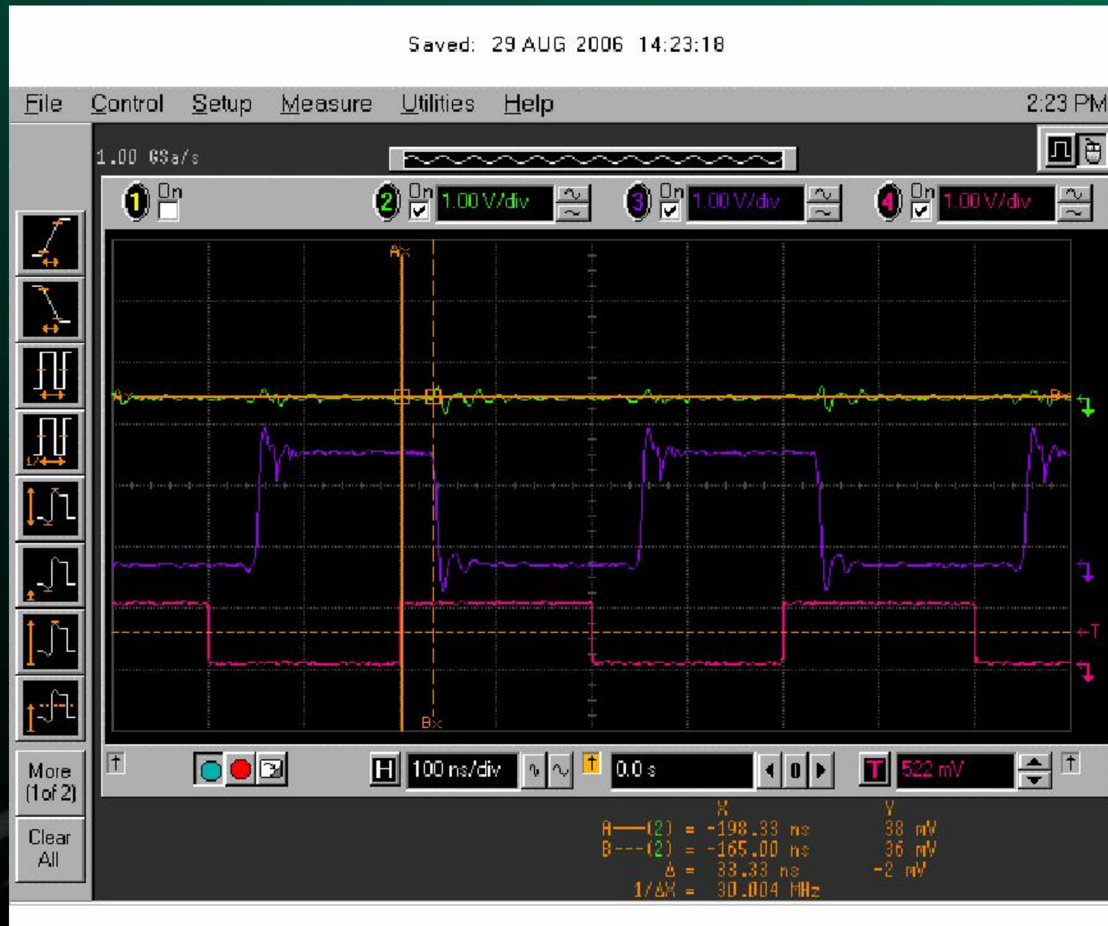
Receiver



Rx Out

Rx In

Crosstalk



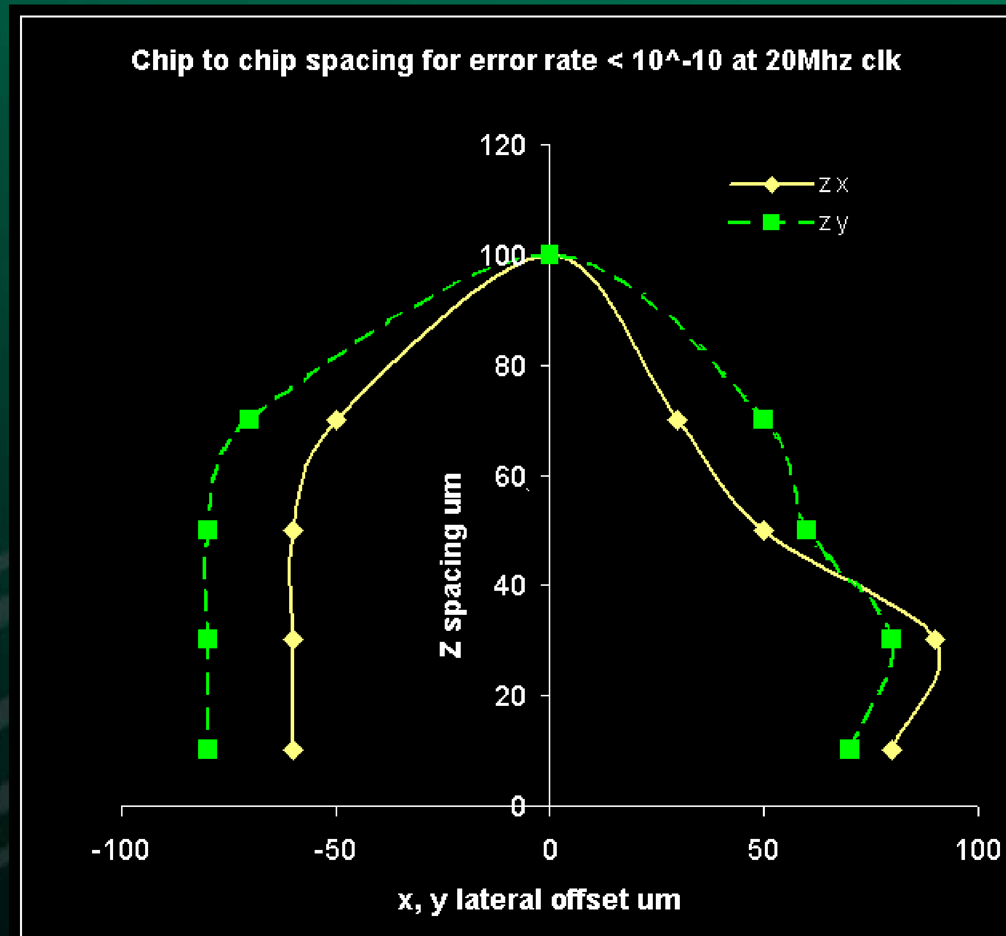
Channel 2: Adjacent

Channel 1 Rx

Channel 1 Tx

Alignment Sensitivity

- Alignment limits on two axis and heights
- 120um antennas
- The zone inside the curve has an error rate less than one error per 10^10 bits.
- The slightly different shape on the +lateral offset axis is likely due to the fact that this direction is the edge of the chip while other directions are over silicon.

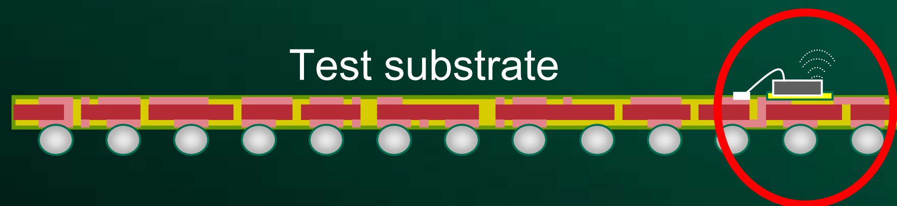


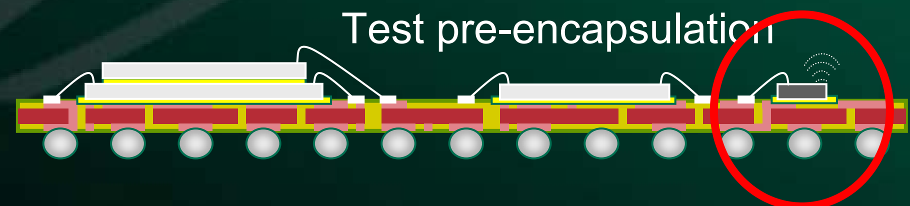
SiP/MCM Application

- Wireless Test Access Port
  - A chip with Scanimetrics' wireless transceivers designed to be integrated into the SiP/MCM/etc.
  - Allows testing of the Hybrid like a wafer during the assembly process
    - On a prober, with a probecard

Our solution

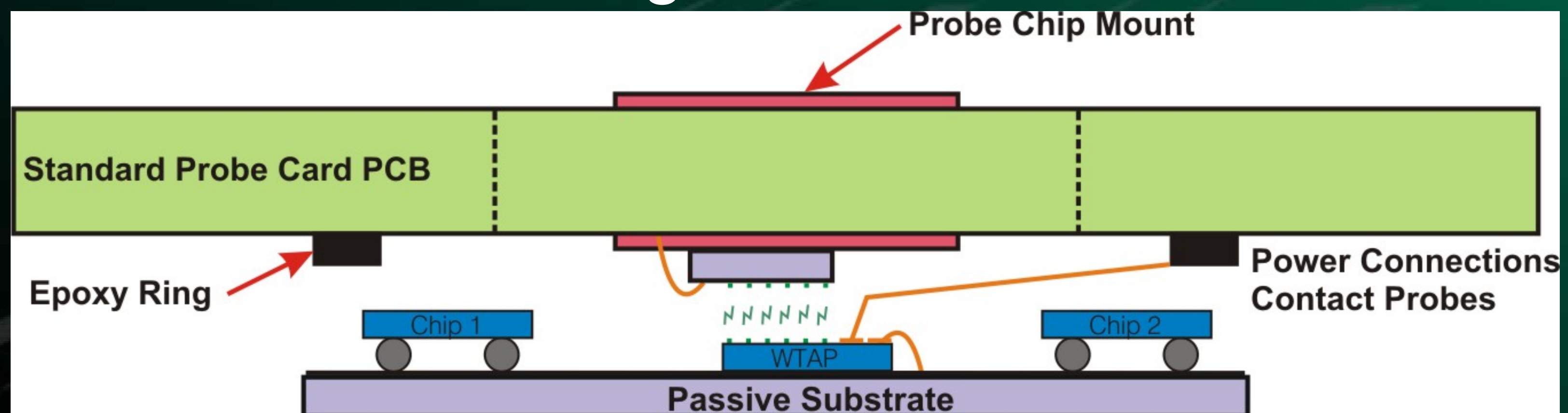
Implemented as an independent device populated on the multichip substrate early in the assembly process



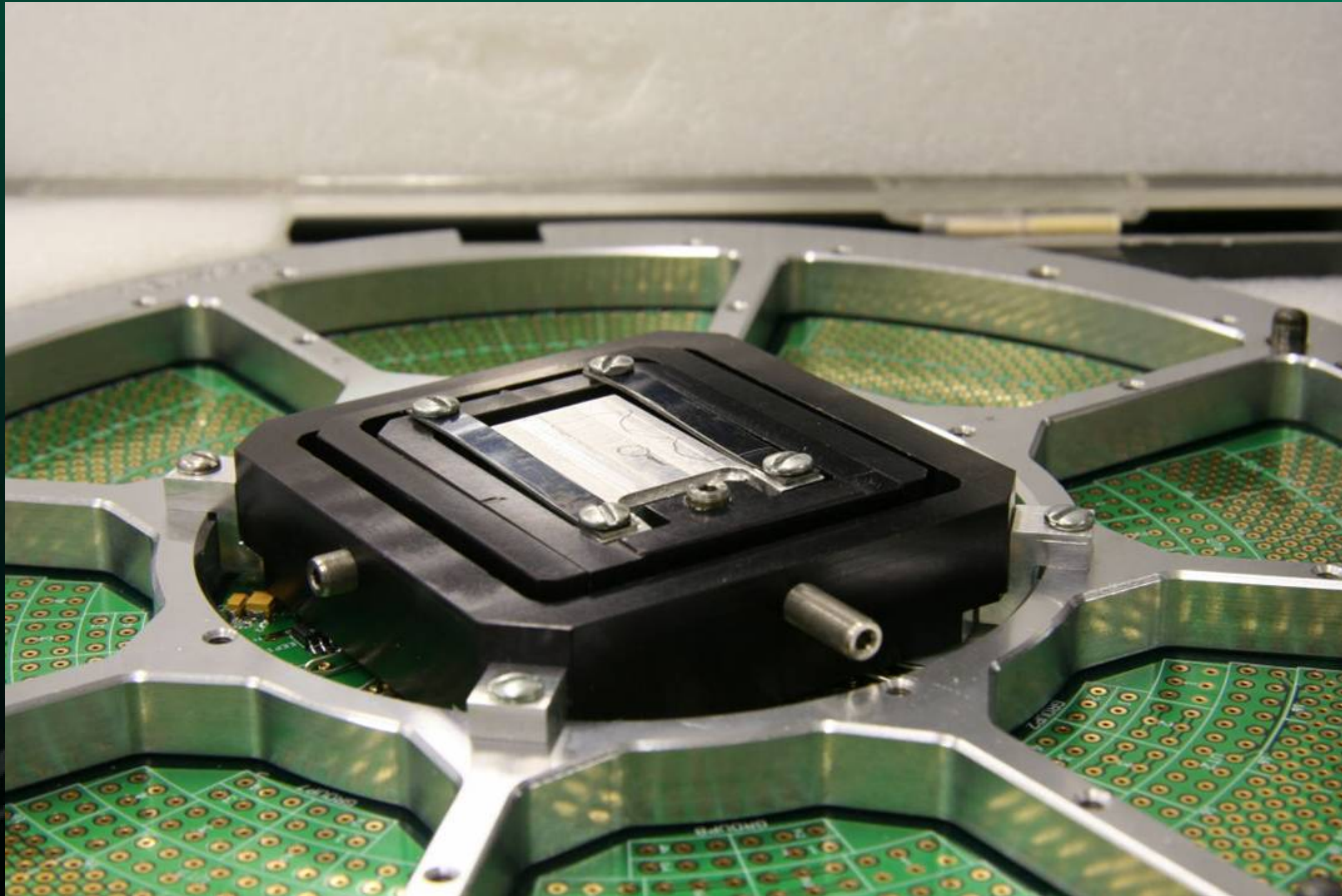


MultiChip Testing

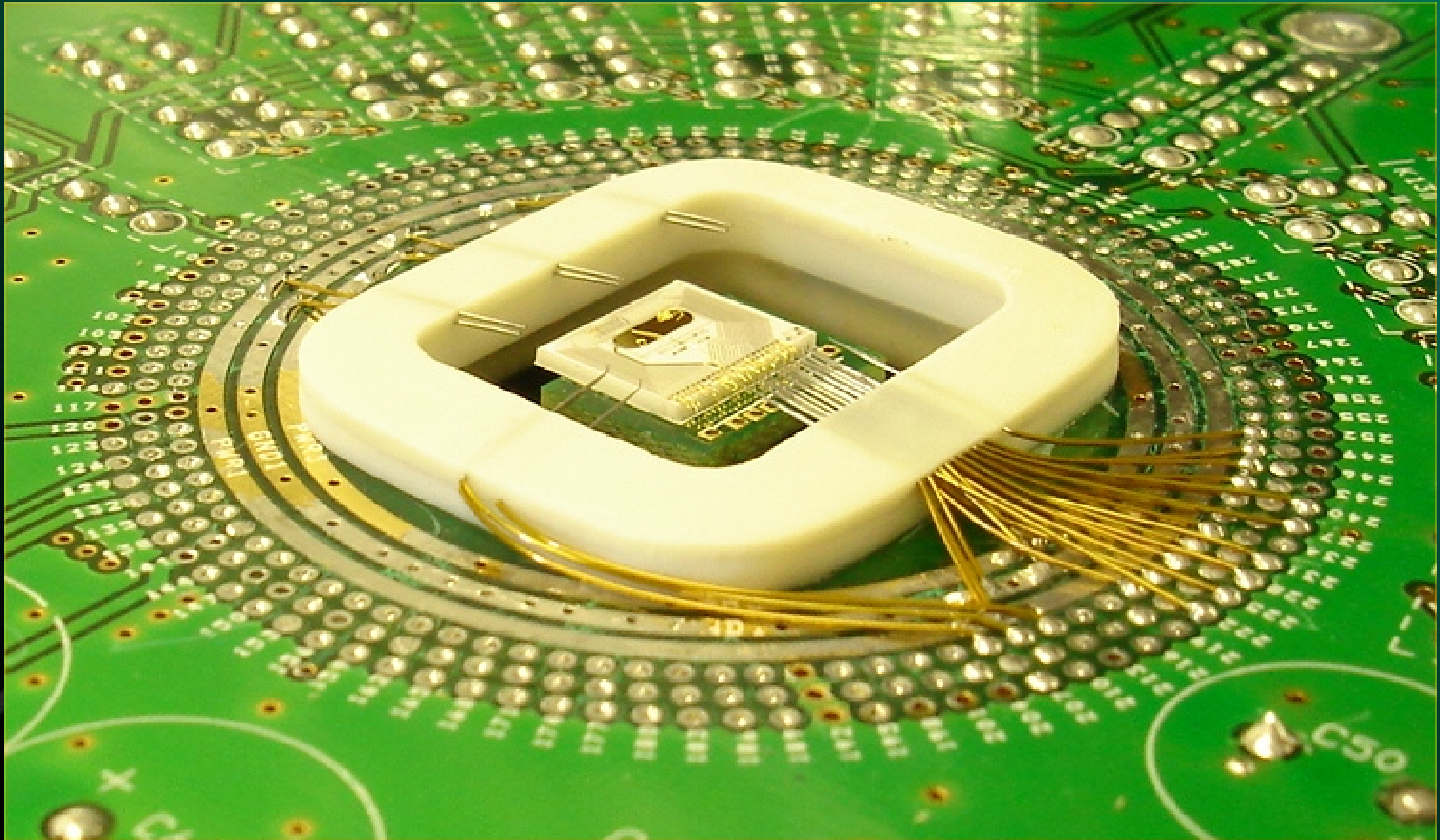
- Wireless Test Port (WTAP)
  - Allows testing during the assembly process so bad “KGD” and assembly errors are detected early
- Increases yield of SiP/MCM device
- Reduce discard of good die



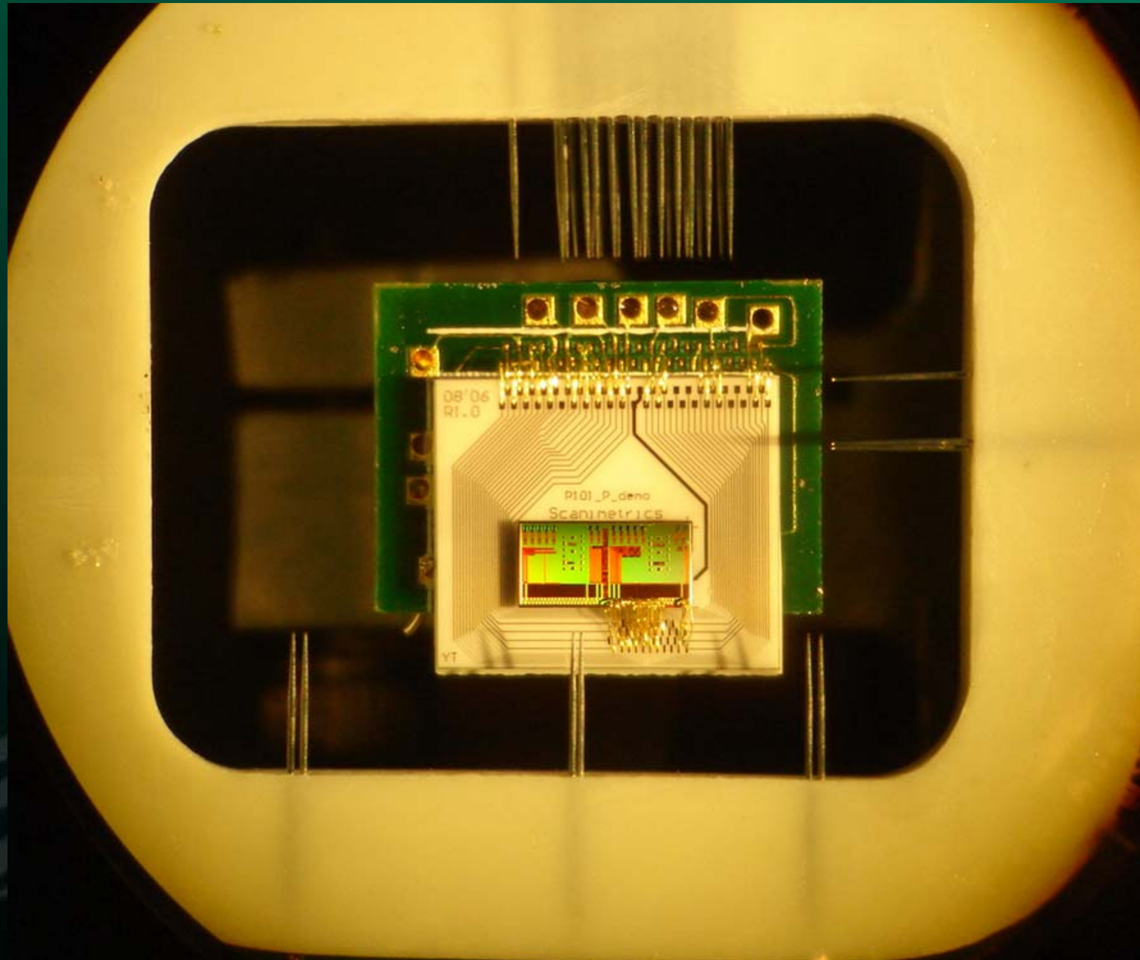
Probecard Top View



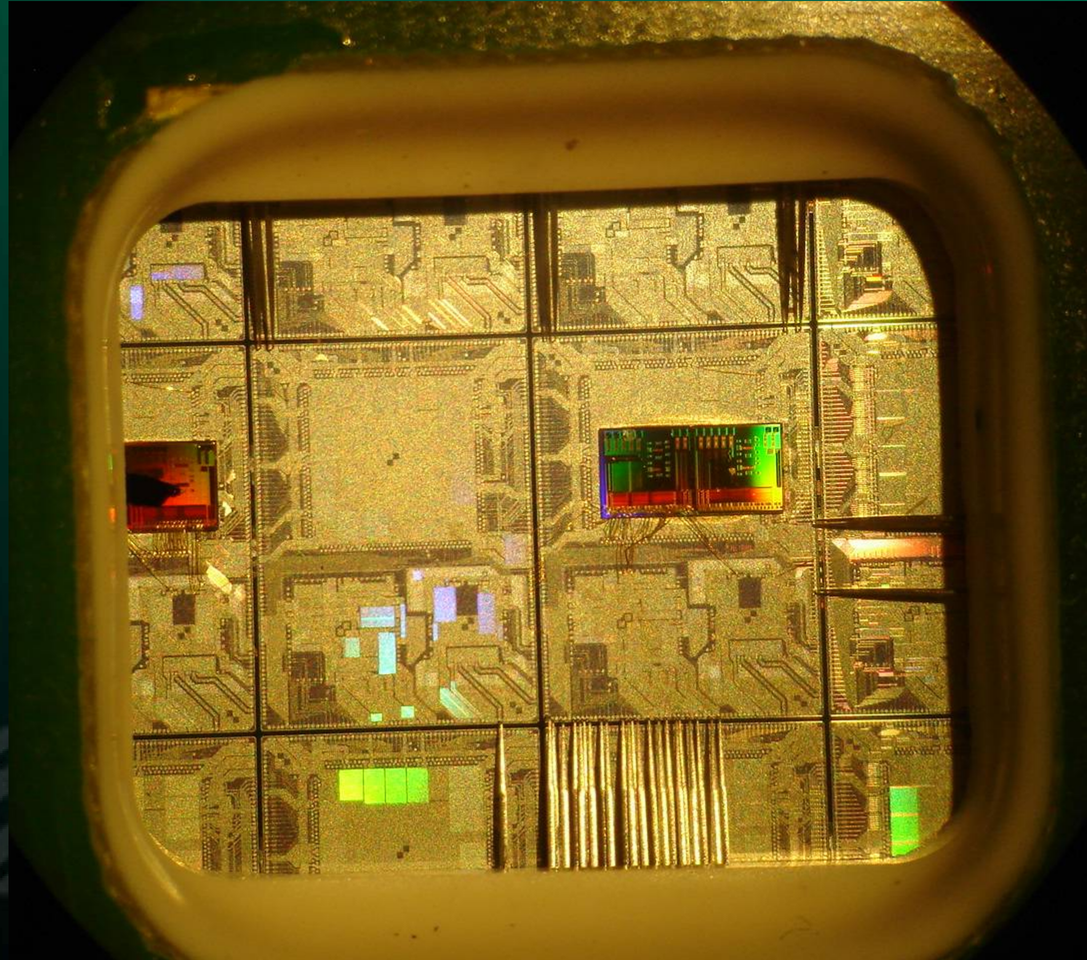
Power Top Left
Wireless Signal Center



Probecard – Bottom View



Probecard – Through View



Conclusions

- Successfully demonstrated hybrid probe card with wireless data channels and contact-based power delivery
- Robust data transfer of wireless channels proven, with no crosstalk
- Constructed and demonstrated solution for SiP testing application
- Currently finalizing design for production qualification

Thank You

- Acknowledgements

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