Enabling X144 Wafer Sort

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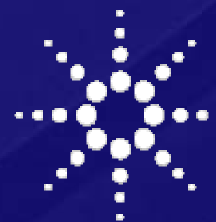


Agilent Technologies
Innovating the HP Way

Outline

- Parallelism
- Performance
- Repeatability
- Reliability
- Results

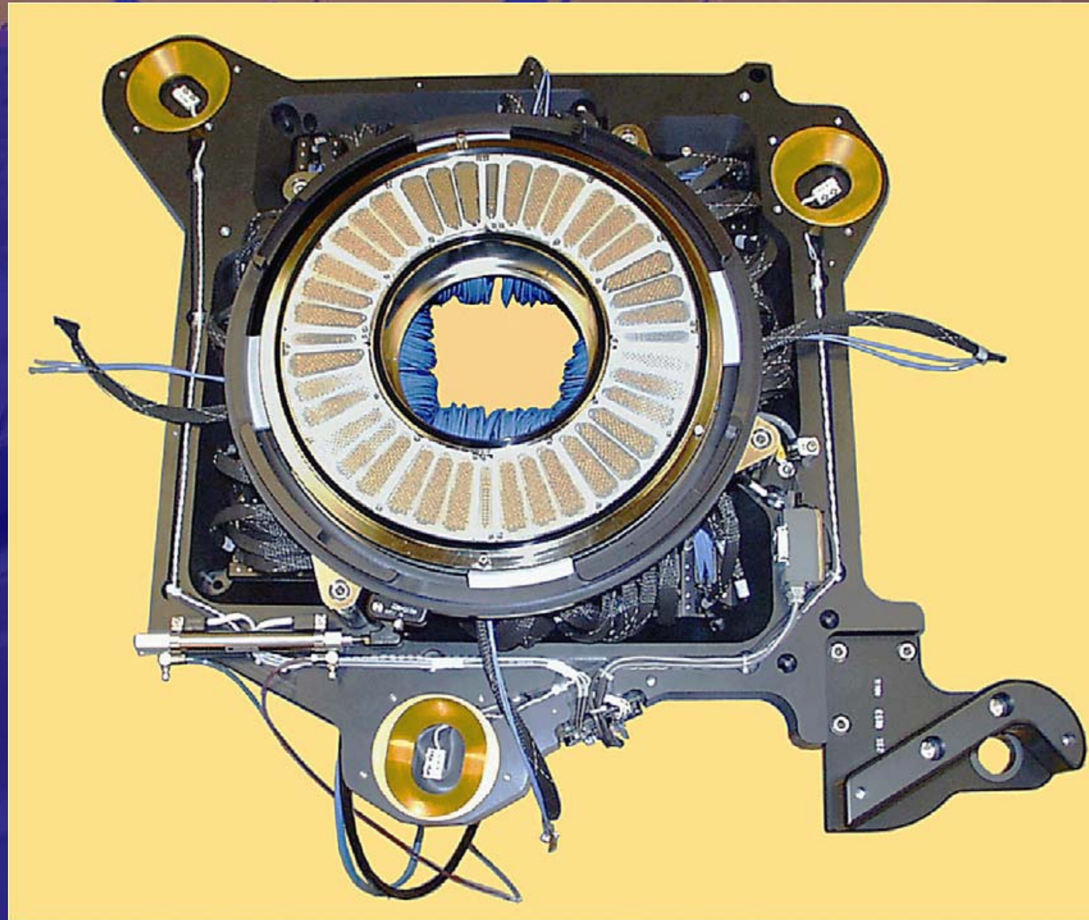
Parallelism

- 2304 “signal” channels – tests up to 144 Memory / embedded devices simultaneously
  - Each of 36 “sites” has 64 full I/O channels, 40 utility channels and an isolated ground plane – 36 separate test systems in a single test head

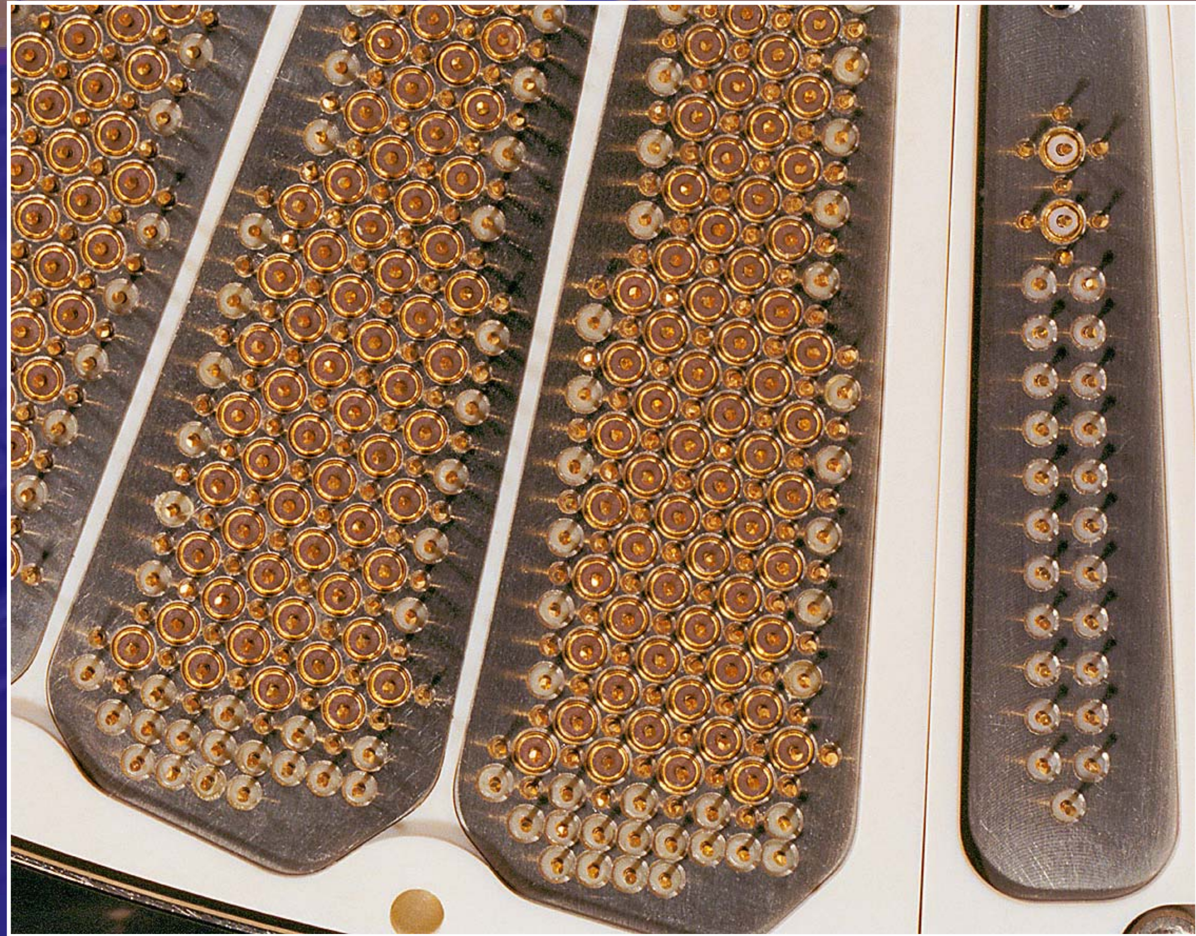
Parallelism, cont.

- Vacuum interface
  - 2nd Generation design
  - 7290 spring contact pins – 640 pounds of force required
  - Static dissipative vacuum lip seal

Parallelism, cont.



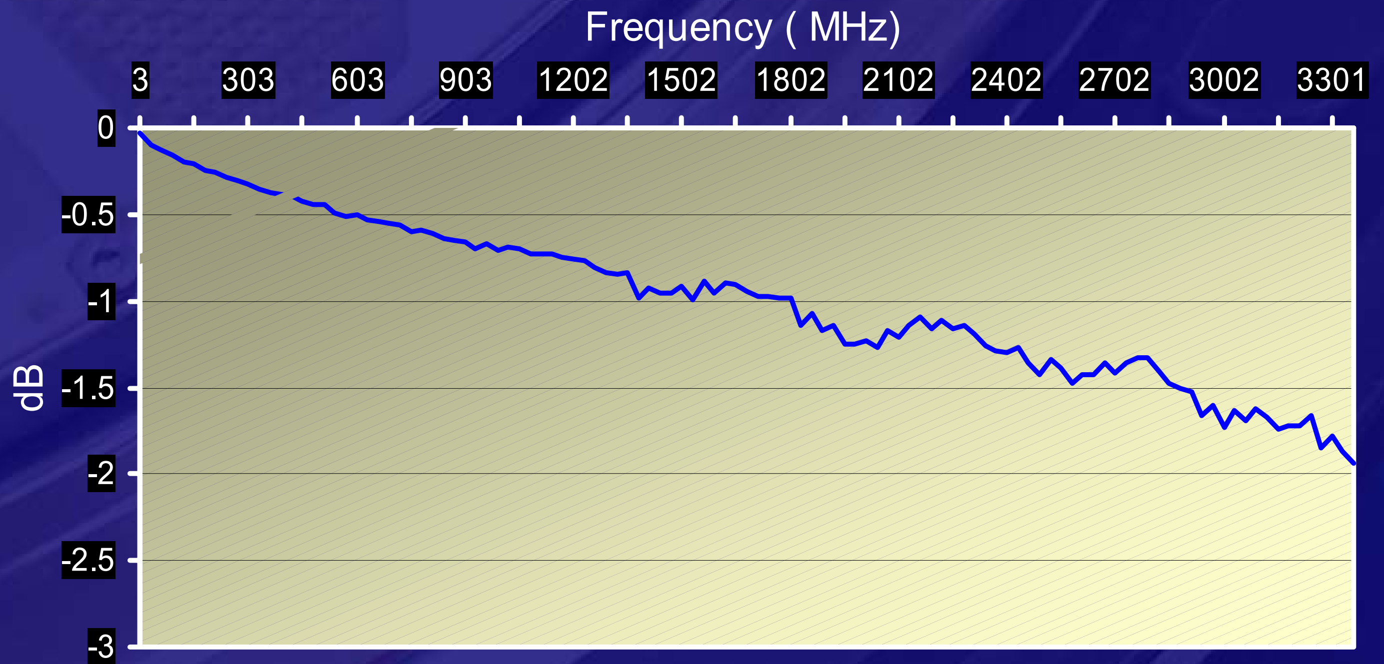
Parallelism, cont.



Performance

- It's the Transmission Line, Stupid!
- Interface bandwidth for signal channels: < 2 dB attenuation @ 3.3 GHz
- Capacitance: < 20 pF between the PE card and the Probe Card

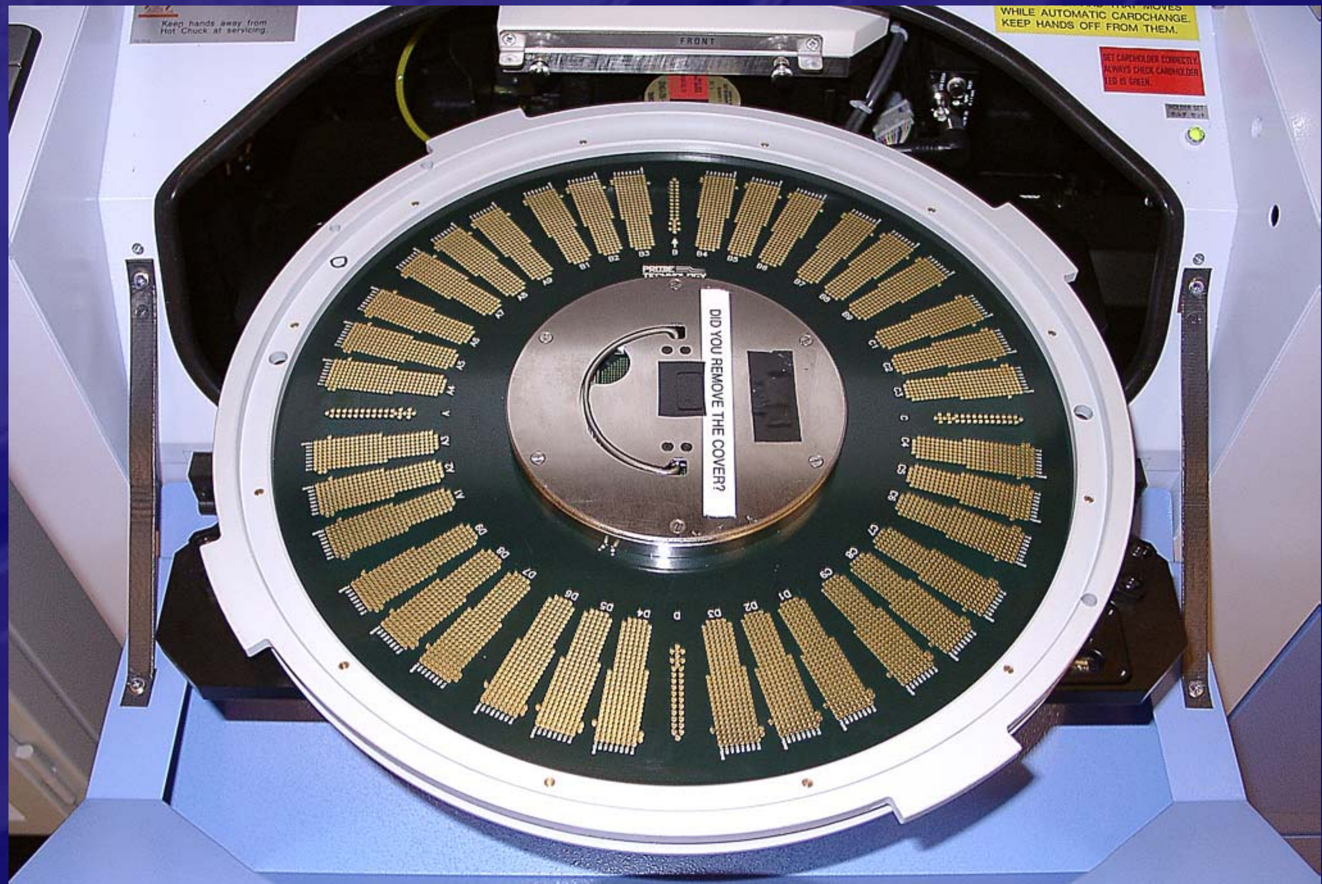
Performance, cont.



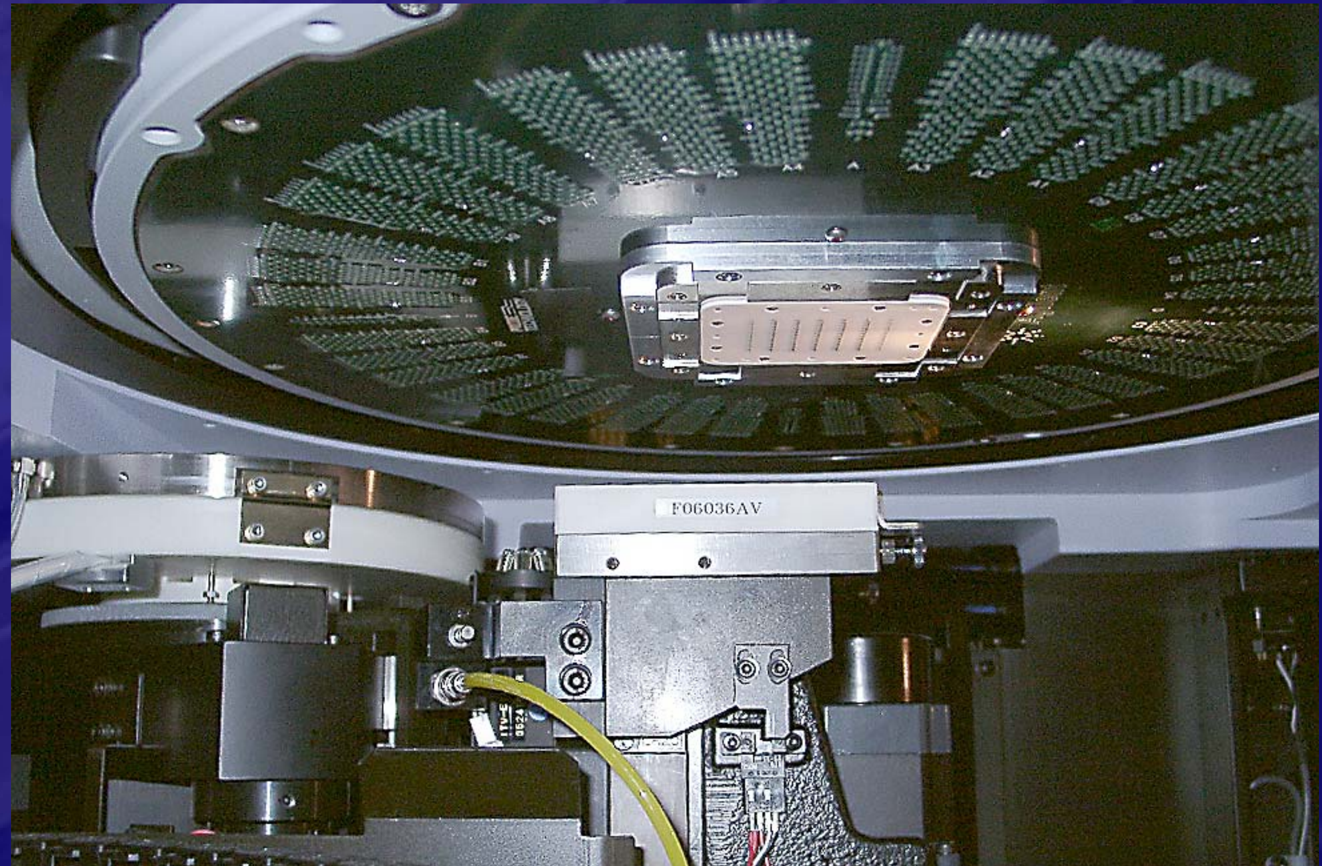
Performance, cont.

- APCC / PCC compatible
- Plastic "Stiffener" ensures consistent planarity of probe card
- System-controlled Retaining Ring

Performance, cont.



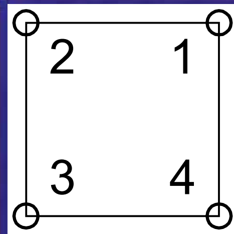
Performance, cont.



Repeatability

- High Rigidity
  - Supports high force probing
- Direct docking
  - Repeatable z-height <5 um
  - Reproducible planarity <4um
    - (plane defined by corner probes)

Repeatability, cont.



Direct Dock
System A
System B

1
2
3
4

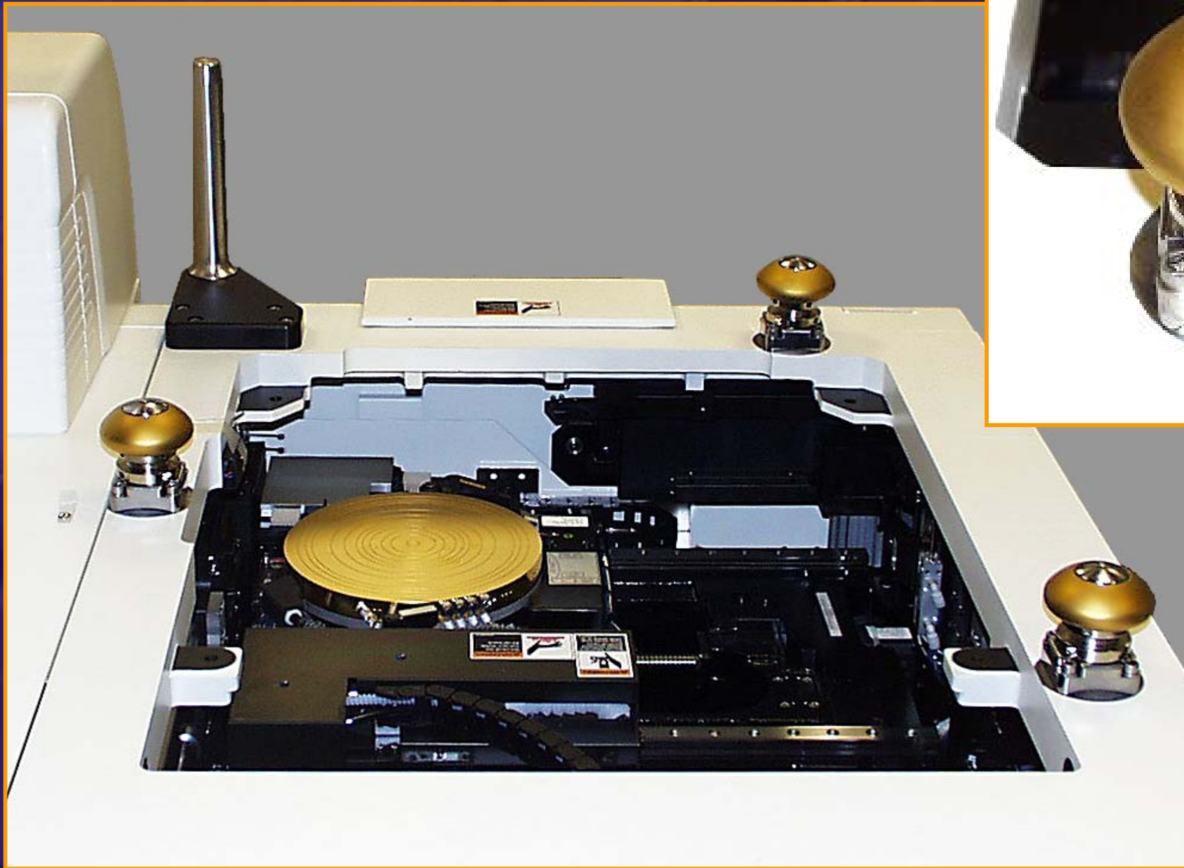
0
-5
-10
µm -15
-20
-25
-30

Repeatability, cont.

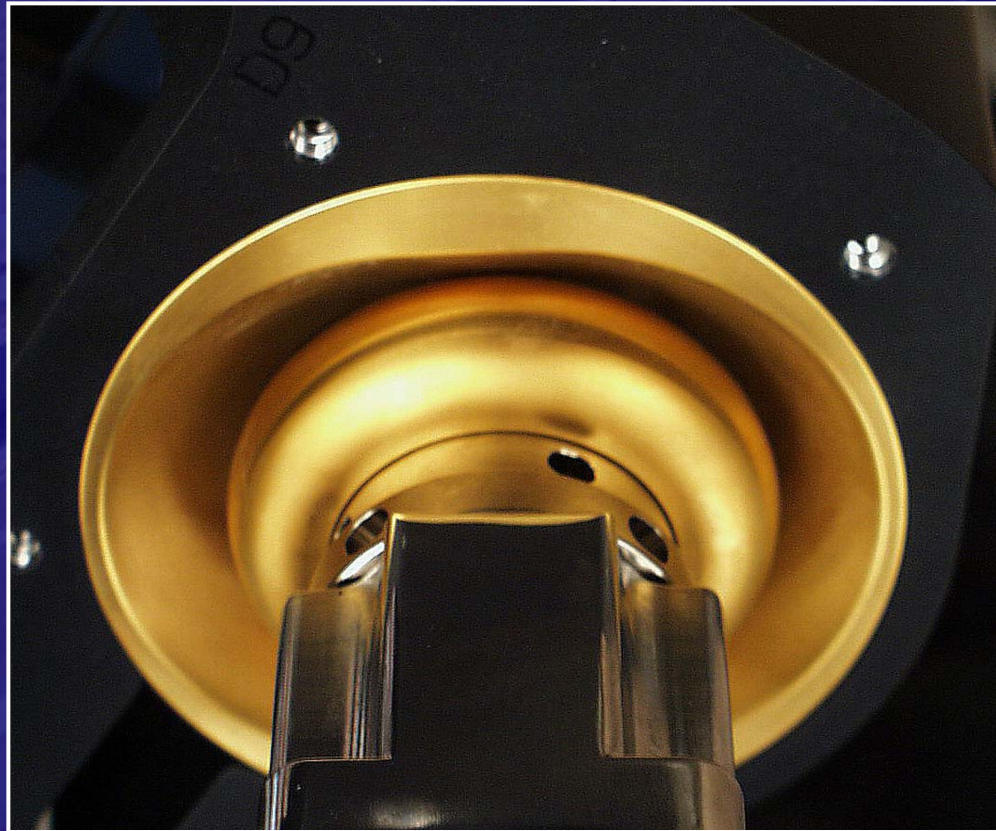
- High Rigidity:
  - Complement to "high rigidity" prober chucks
  - Same probing process w/o regard to probe card pincount

$$k_{DUT\ IF+\ Probe\ Card},\ k_{prober} >> k_{probes}$$

Repeatability, cont.



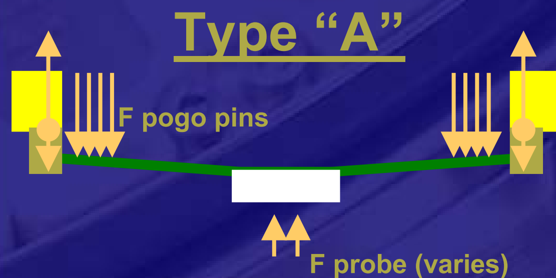
Repeatability, cont.

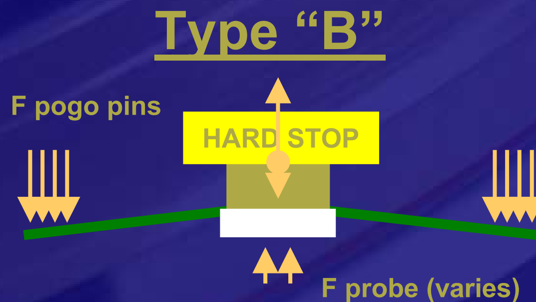


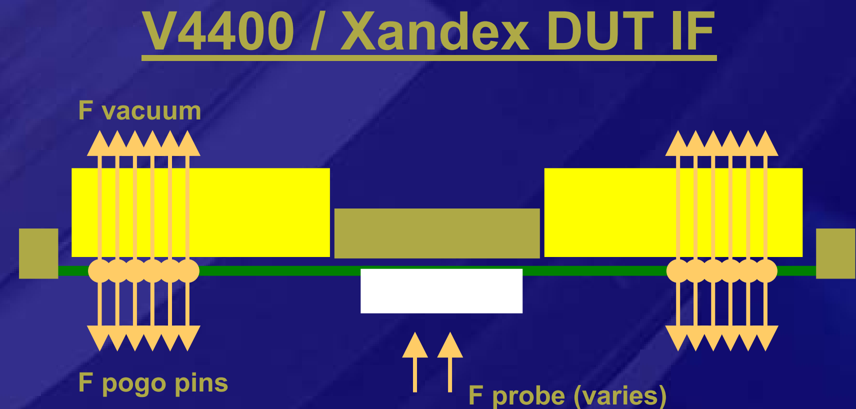
Repeatability, cont.

Repeatability, cont.

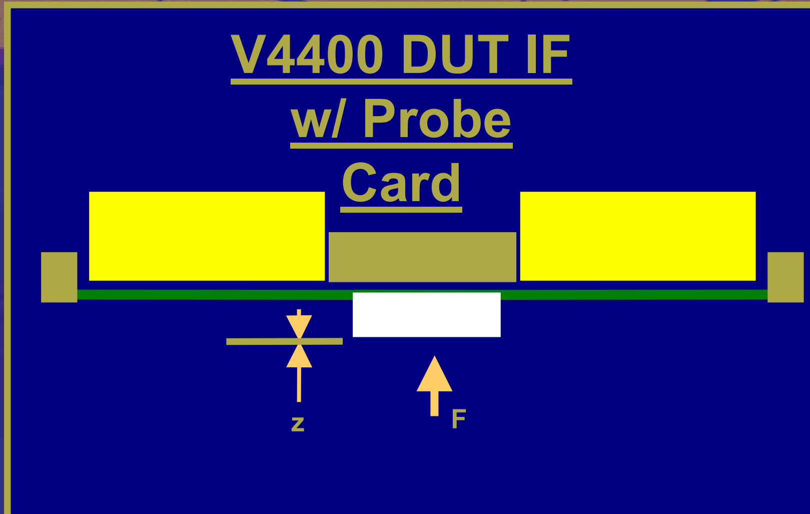
- The Z-reference for the probe card is built into the spring contact assembly

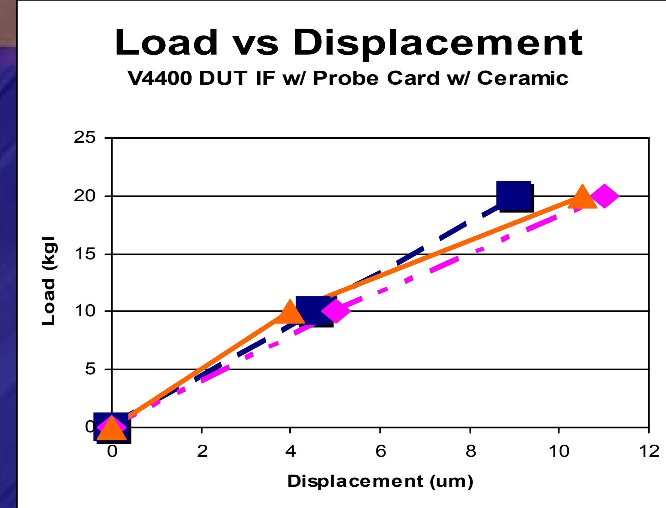


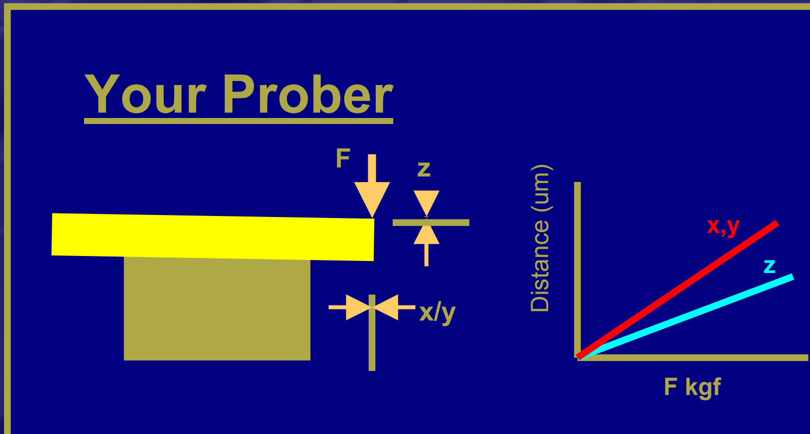


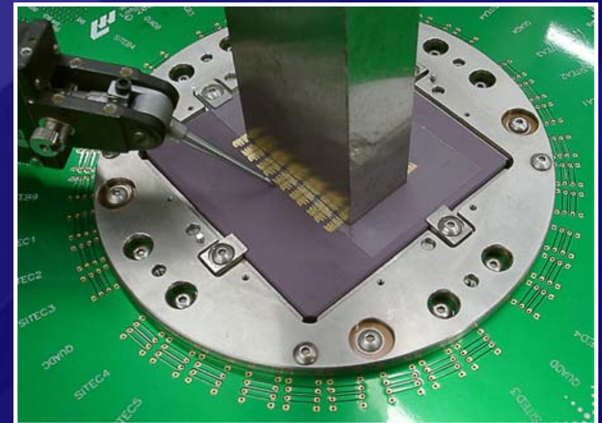


Repeatability, cont.

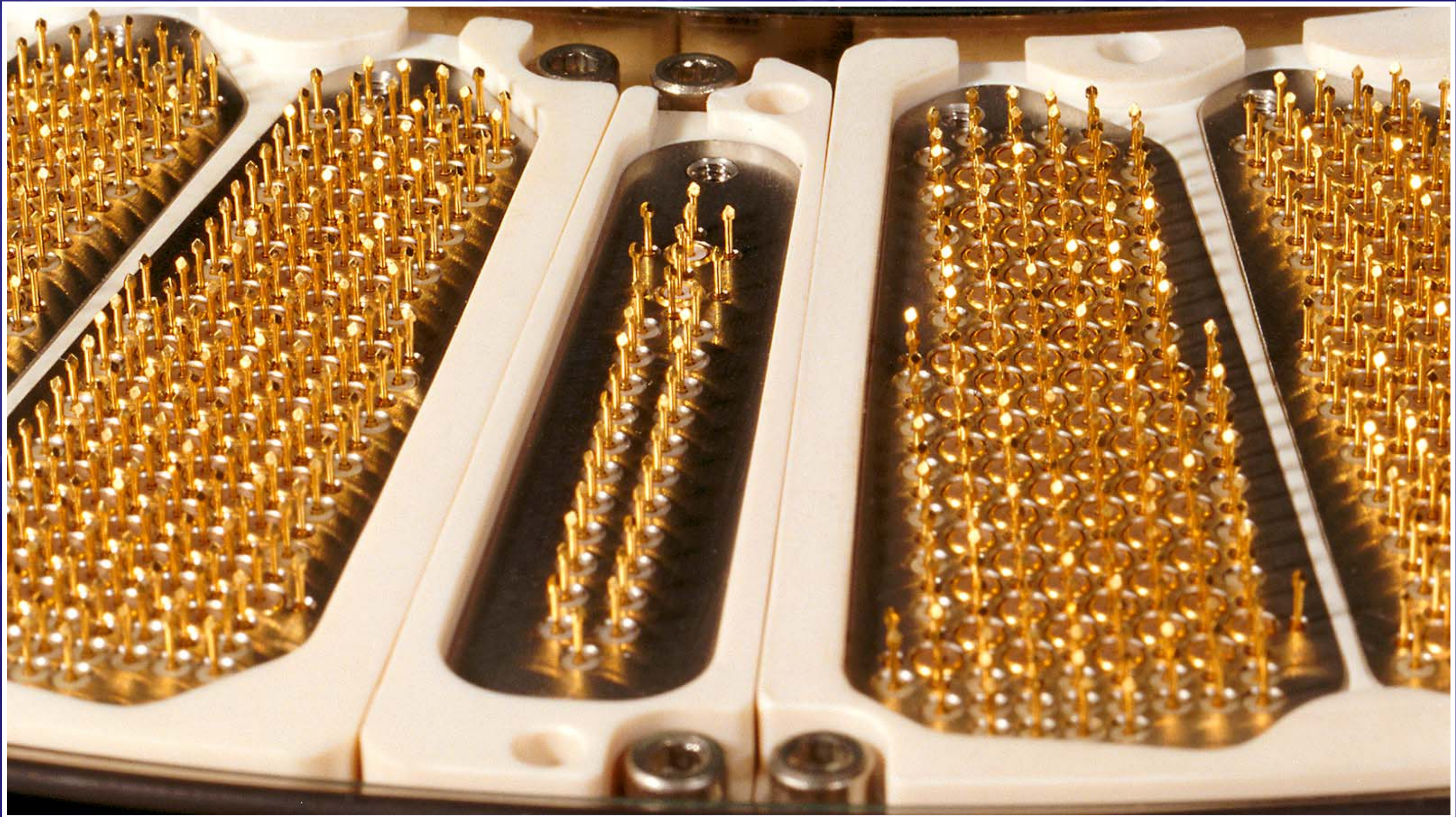






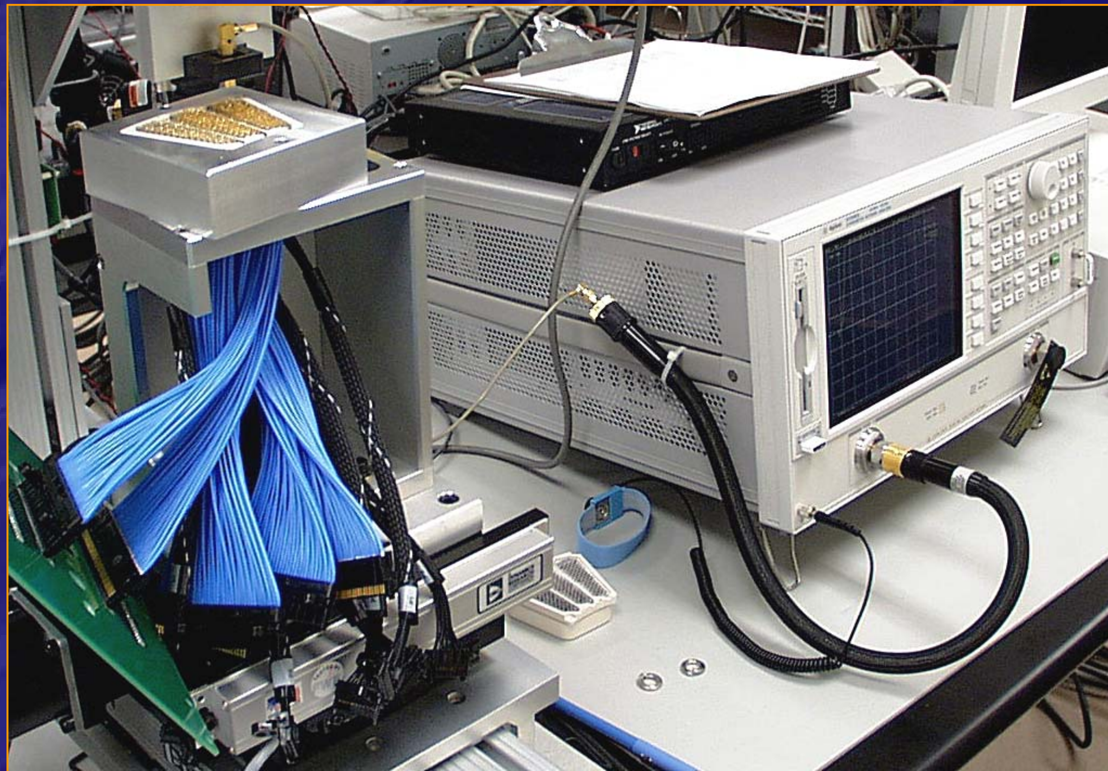


Repeatability, cont.

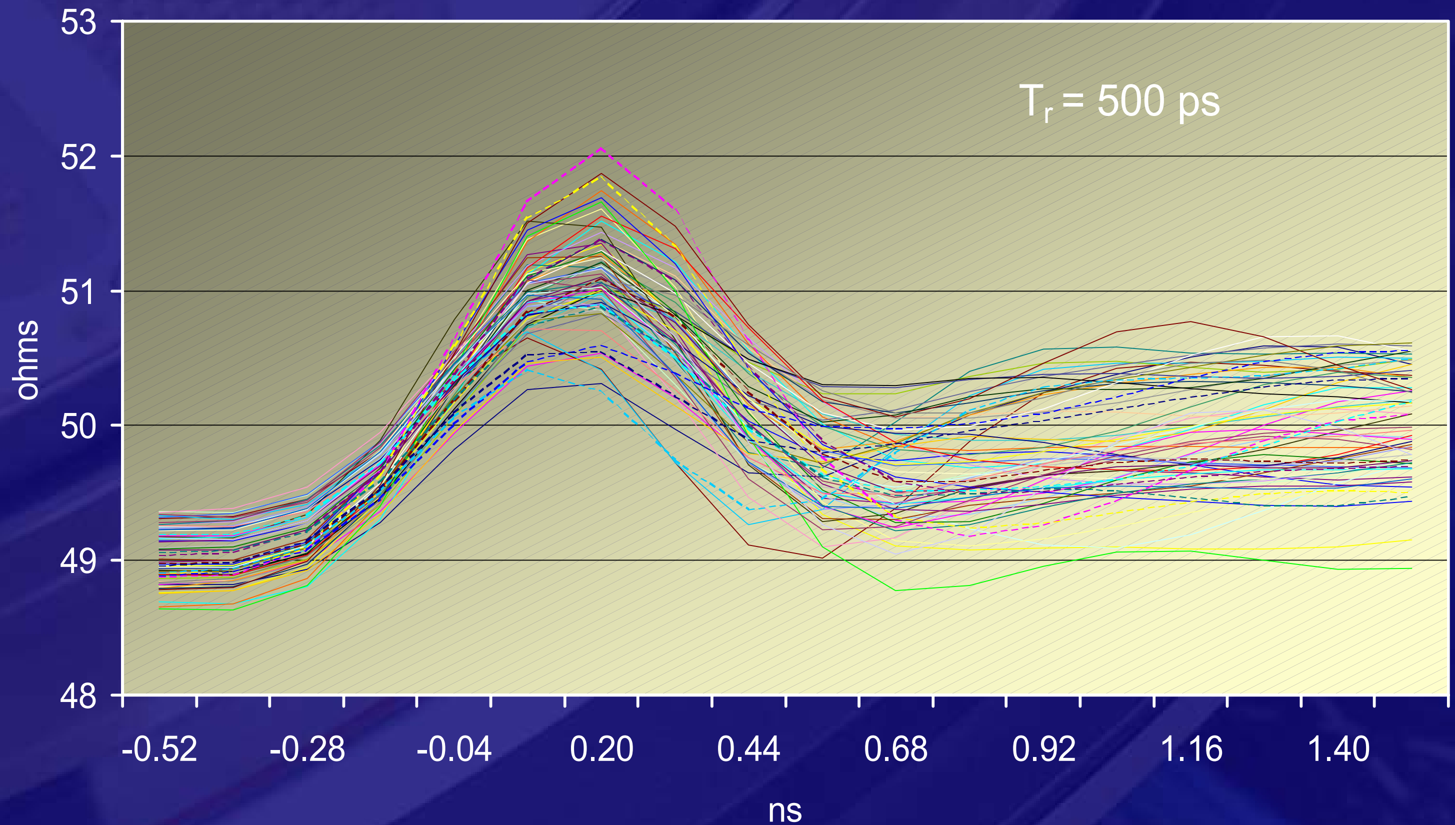


Reliability

- **100% DC and RF domain outgoing inspection**



Reliability, cont.



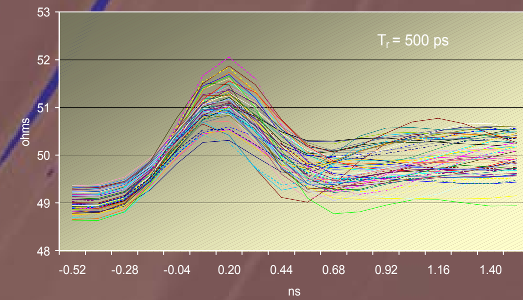
Reliability, cont.

- Component selection
  - The PTI combines best-in-class leveraged technology from previous Agilent ATE projects, components from partner suppliers as well as Xandex-proprietary technology

Reliability, cont.

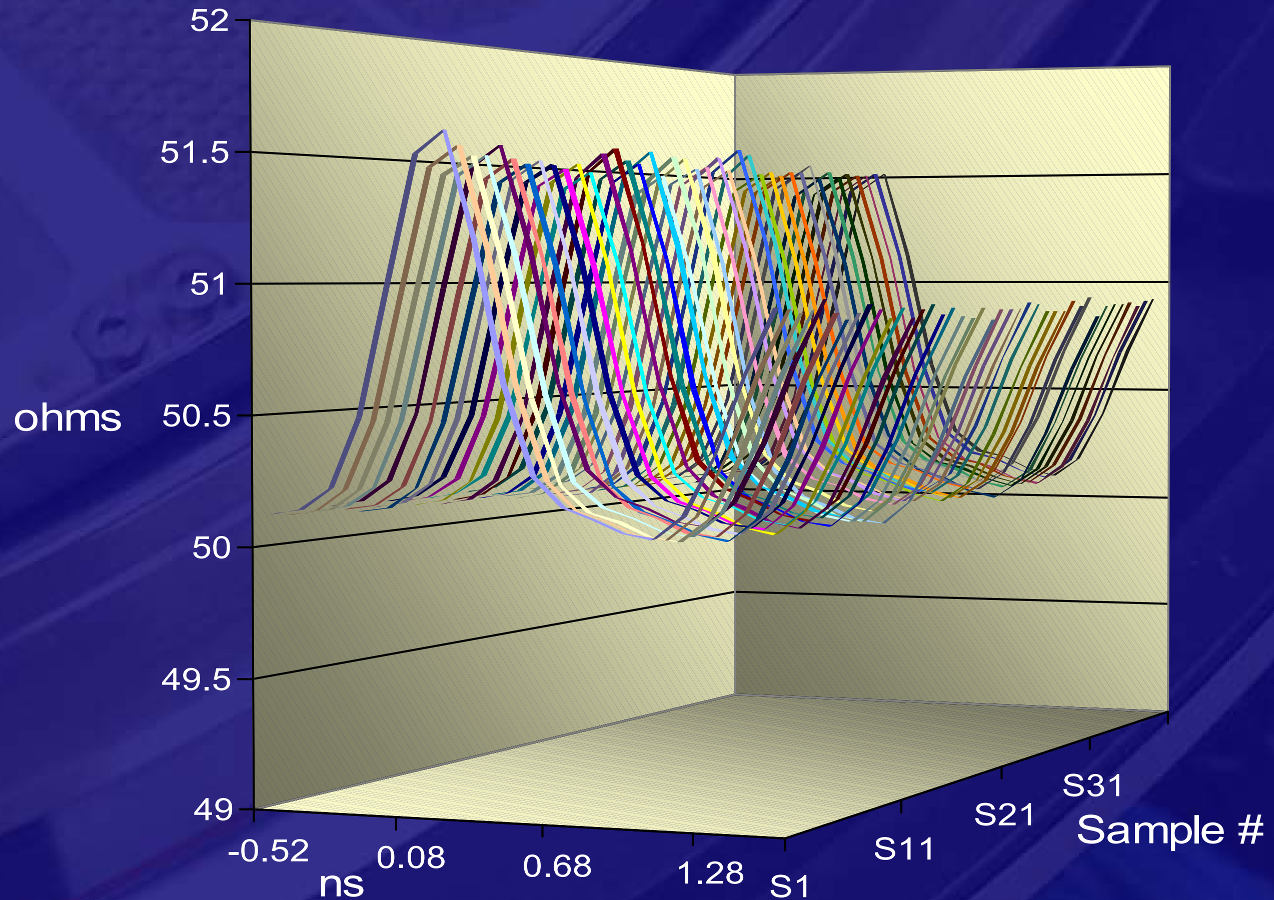
- Partnership with component suppliers:
  - Vast number of spring contact pins requires highest possible reliability
  - Custom cable-to-PE-card interface provides cost-effective high bandwidth performance

Reliability, cont.

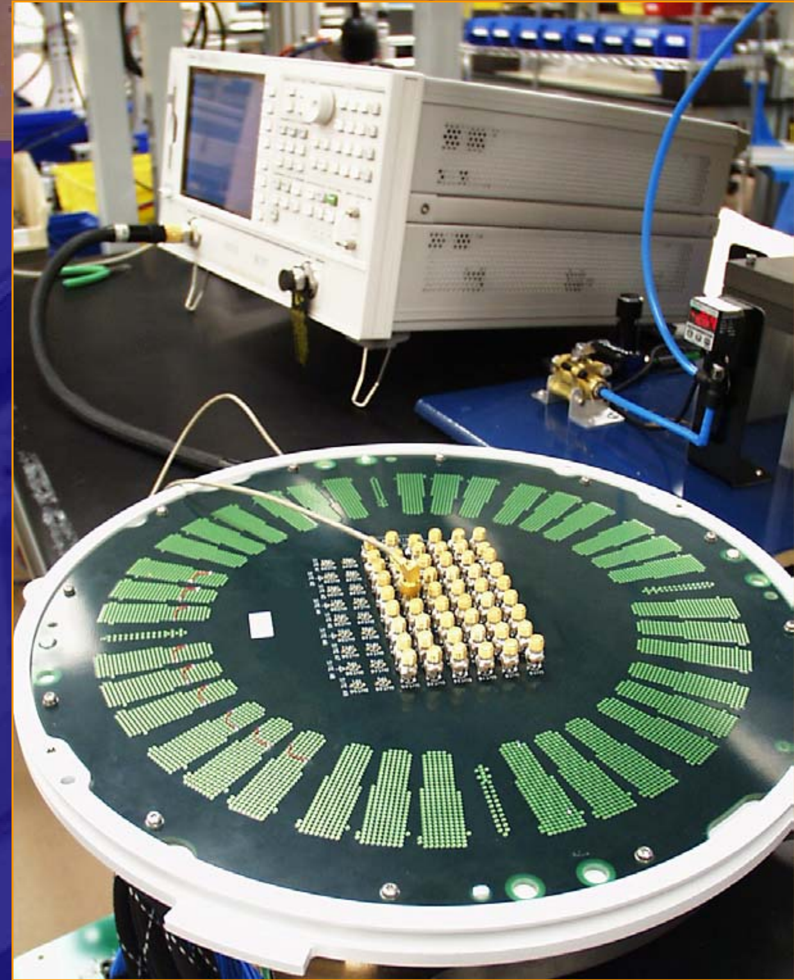


54
53.5
53
52.5
52
ohms
51.5
51
50.5
50
49.5
49
-0.52
0.08
0.68
1.28
ns
S1
S11
S21
S31
S41
Sample #

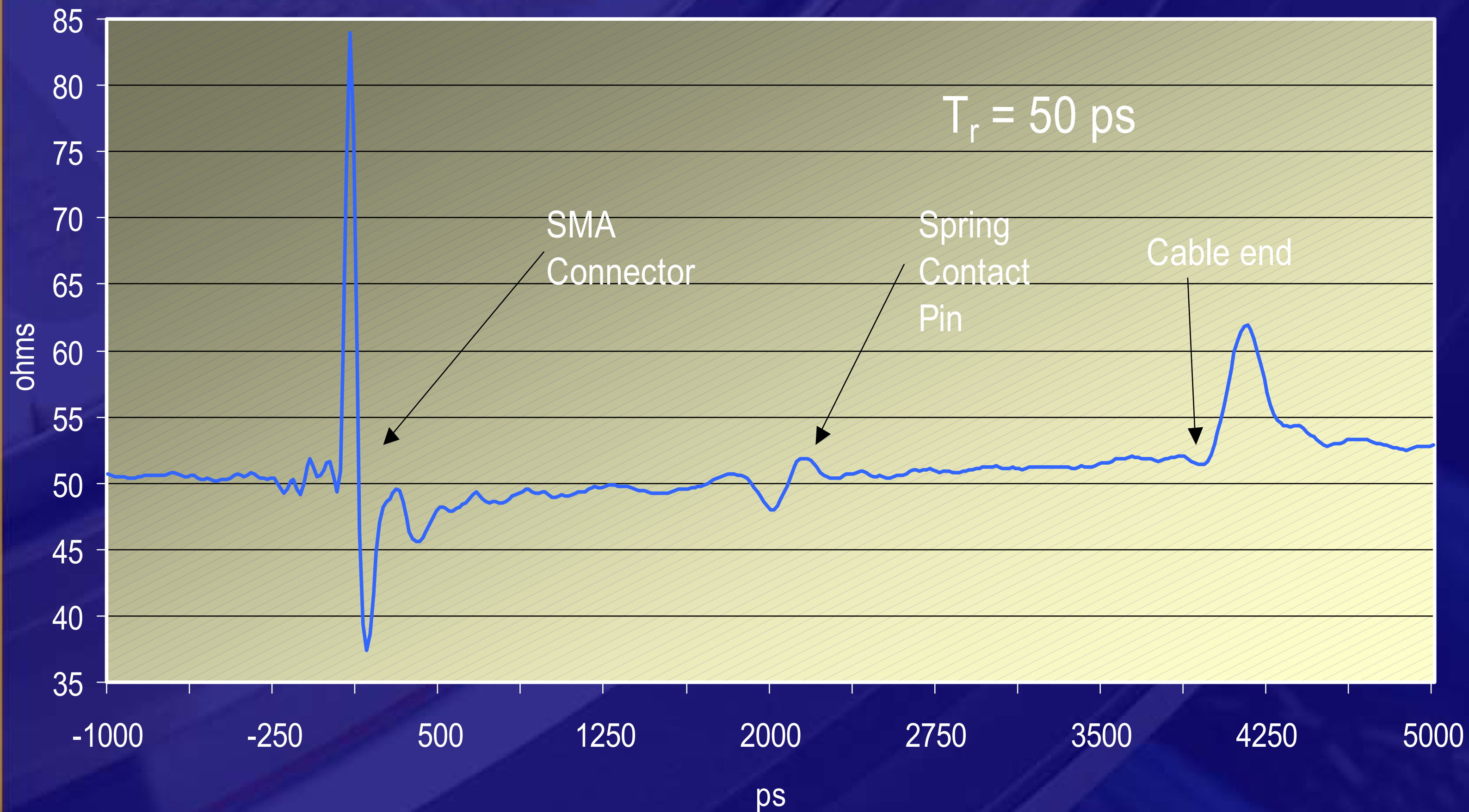
Reliability, cont.



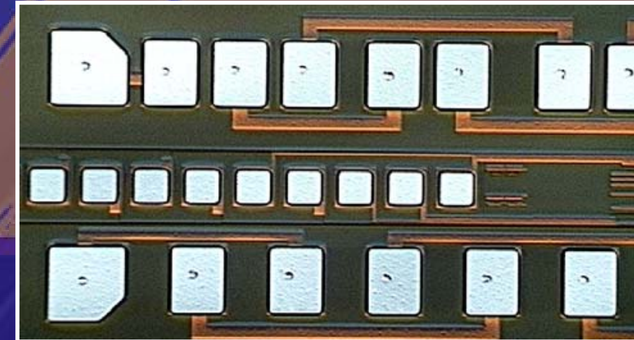
Results



Results, cont.



Results, cont.

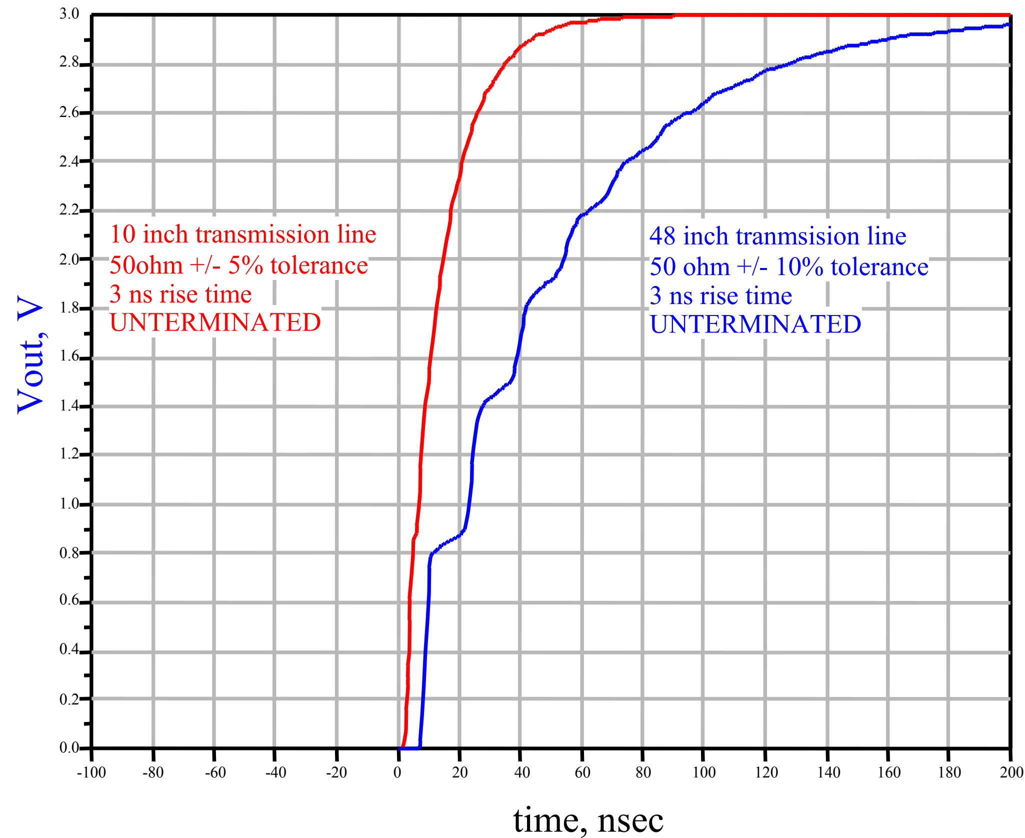


- **Accuracy, Stability, Repeatability:**
  - Process Cpk >2.0 for typical pitch, typical pads
  - Characterized for x36 DUTs w/ >2k probes, 120um pitch, 80x80um pads
  - Repeatability = consistent planarity
  - Rigidity = consistent probe process W/O-R-T pin count

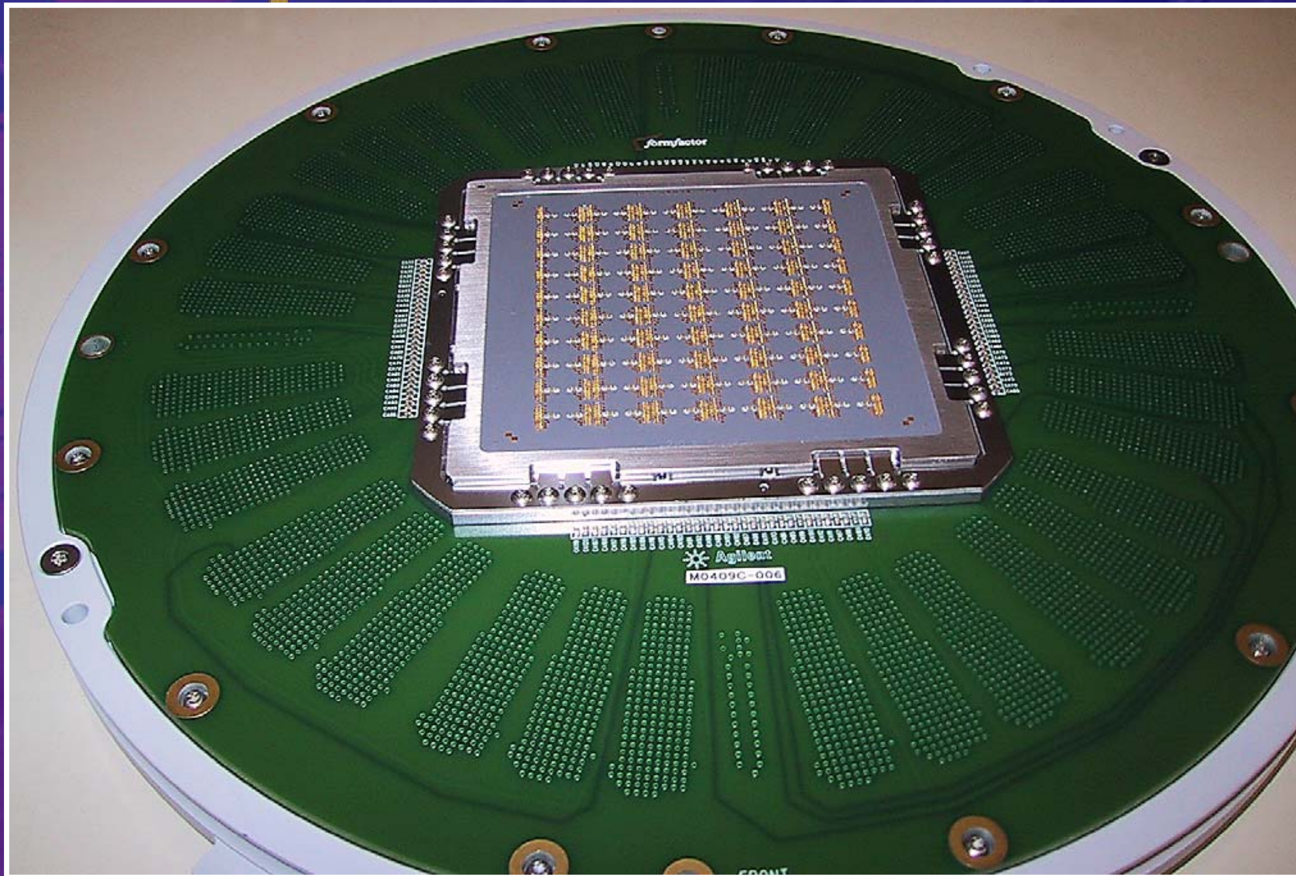
Simplified Al Pad Probing Cpk Model		
	Cpk With Respect to Pad Edge, 85um pads	
		Microns
	Pad Size	80.0
	Mark Width, USL	21.0
	Alignment Range, Measured	22.0
	Margin	37.0
	Lumped Align Errors + Offsets (prober)	14.0
	PM Size Variation	11.0
	Variation	17.8
	Cpk	**2.08**

Results, cont.

- Ideal for low voltage, low power applications
- No impedance mismatches
- Minimized transmission line length



Results, cont.



- IN PRODUCTION
- Probing 200mm wafers in FOUR touchdowns
- Available in multiple probe card technologies

P.P.R.R.R.

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- Performance
- Repeatability
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