



CERPR●BE

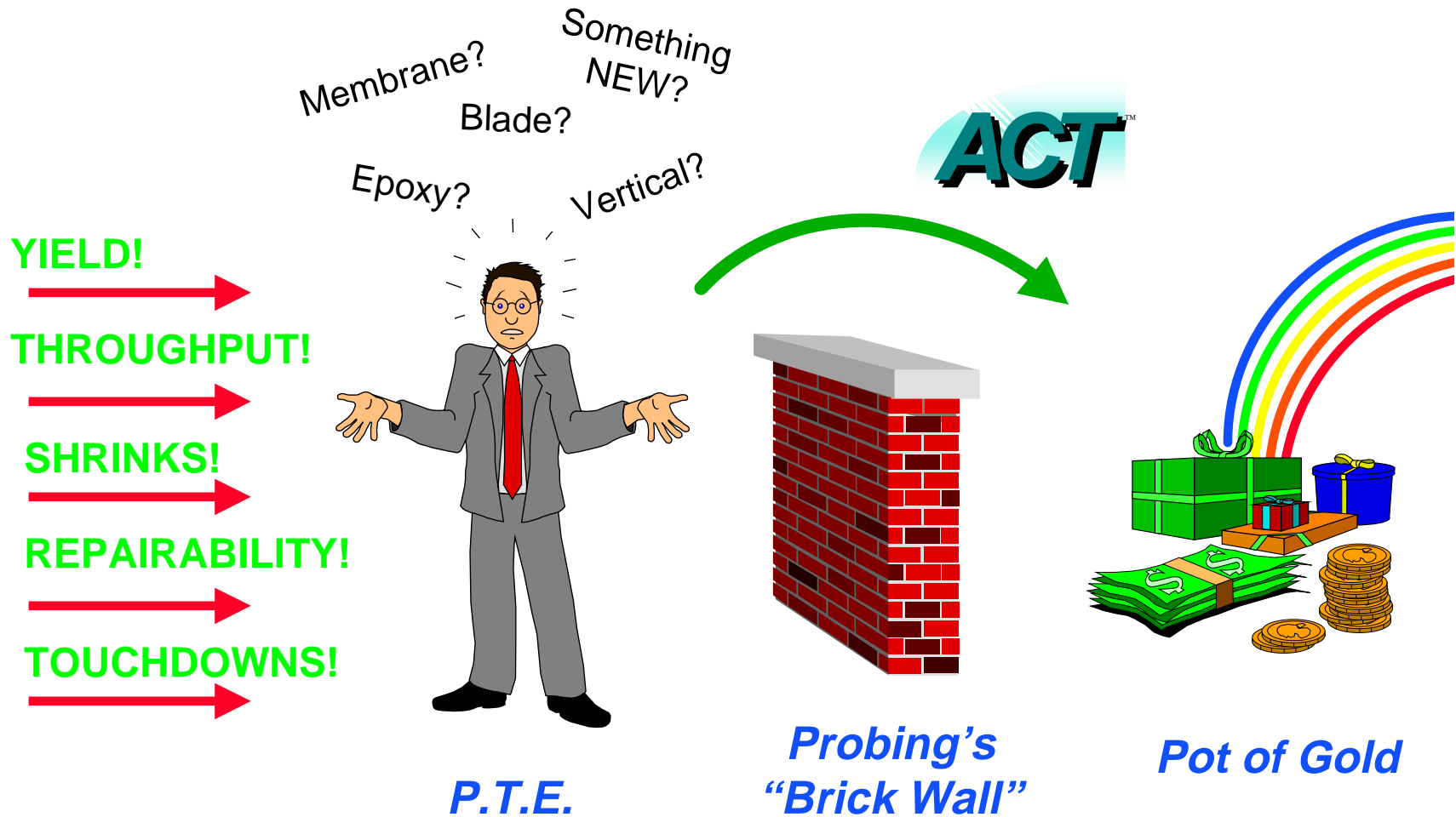
# ***Advanced Cantilever Technology***

*Pete Rogan  
Cerprobe Corporation  
Southwest Test Workshop  
June 4, 1997*

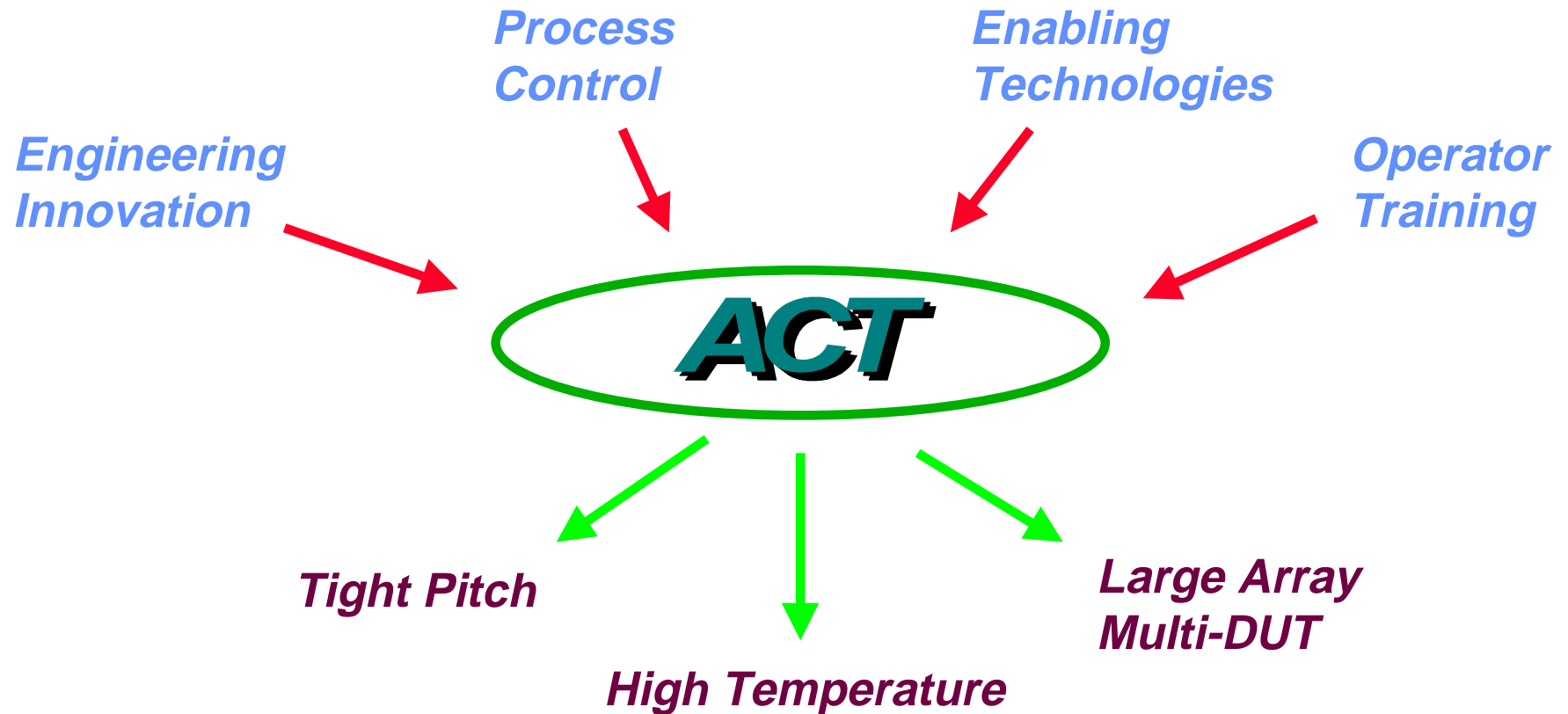




# The Opportunity

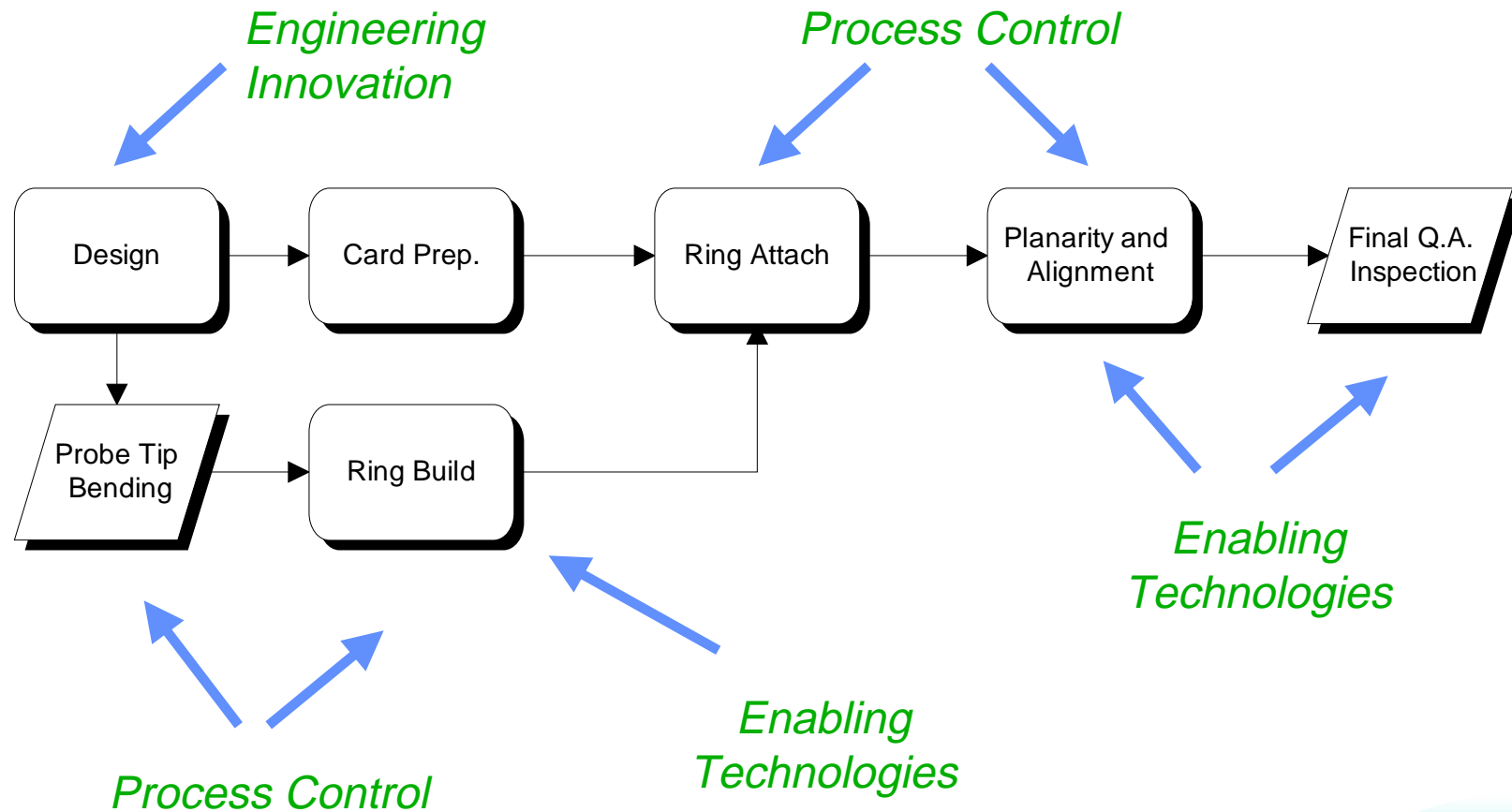


# What is ACT?



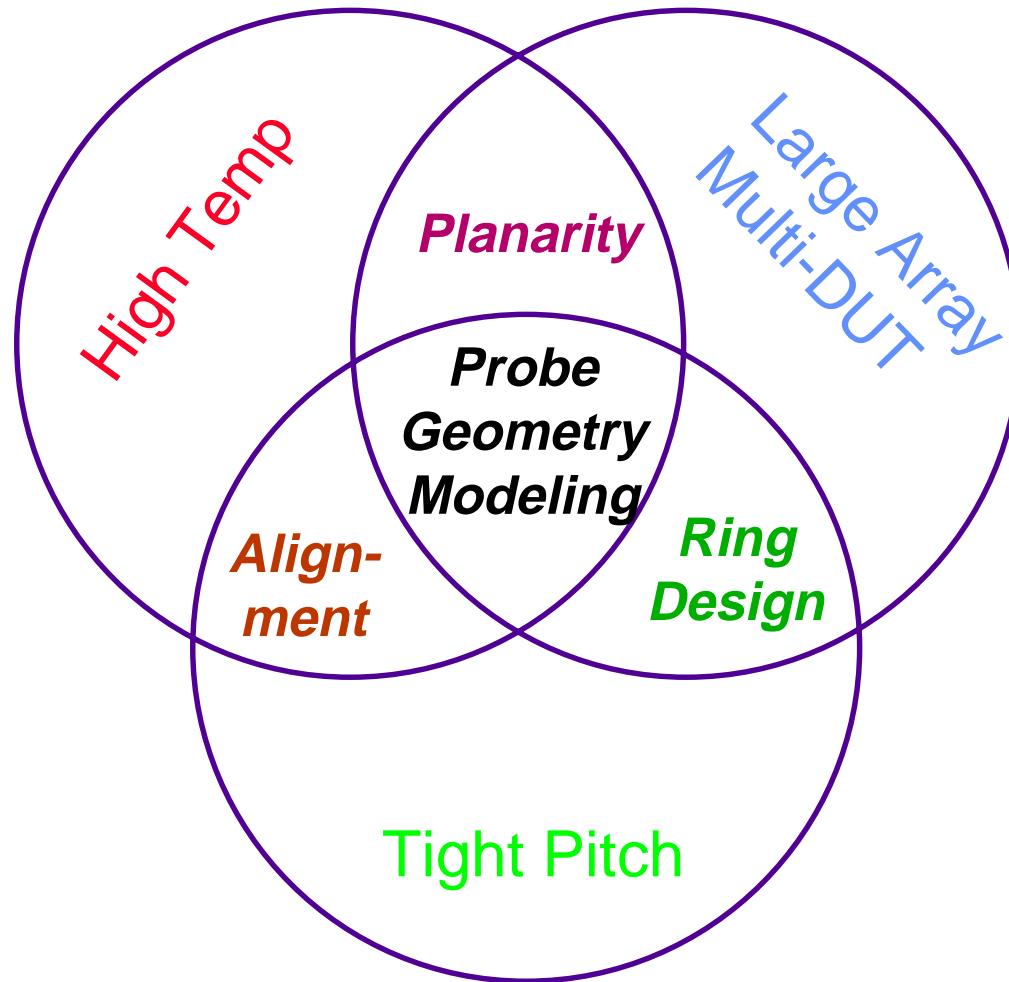


# ACT Process Flow

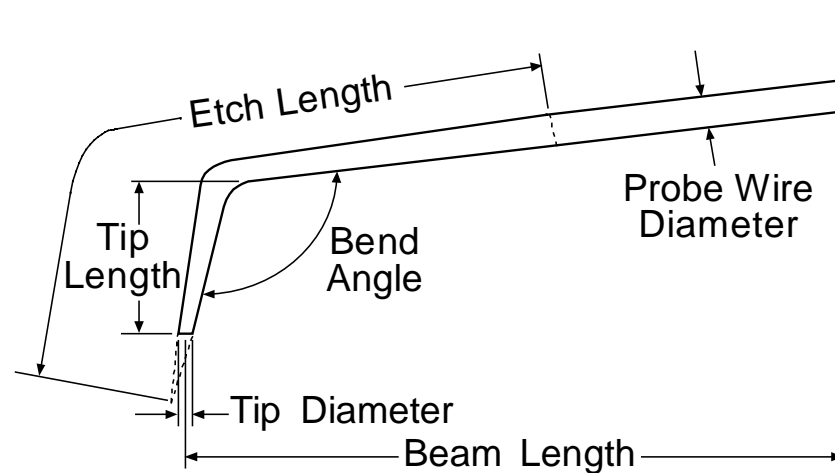




# Design Focus



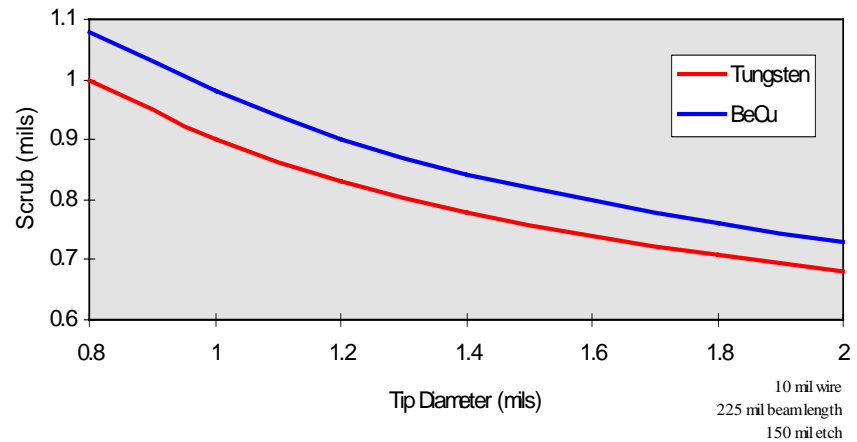
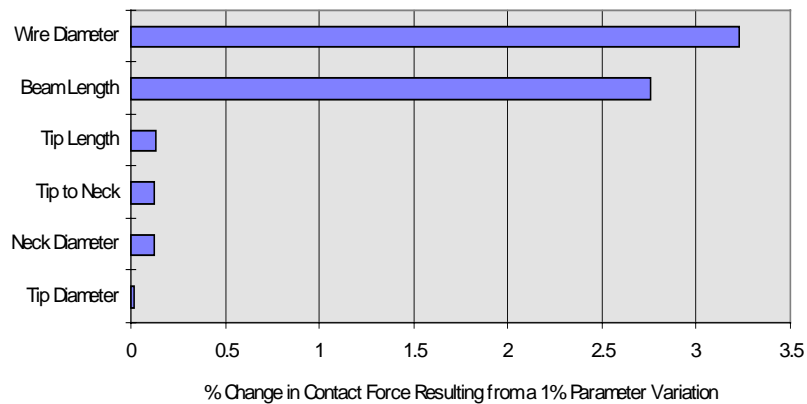
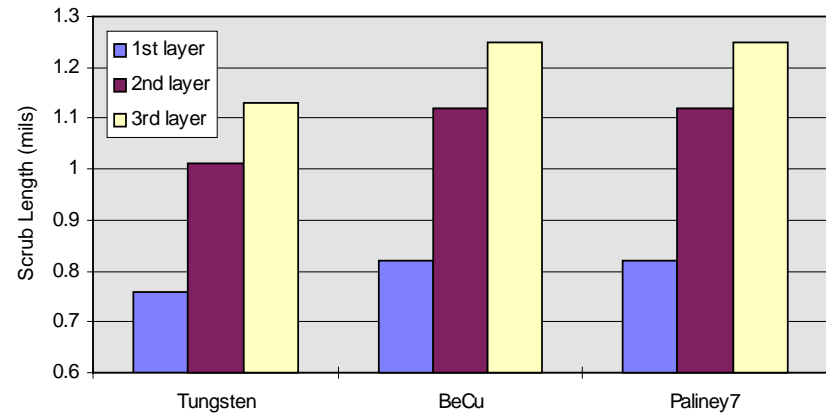
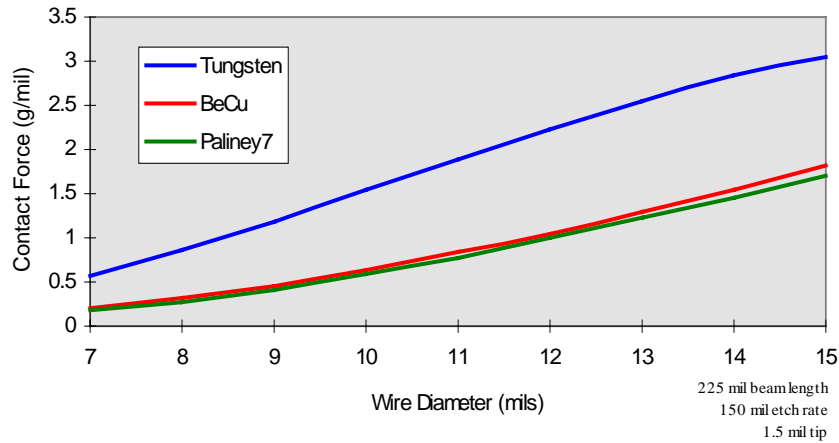
# Probe Geometry Modeling



- Improved contact force correlation
- Scrub length prediction & control
  - » beam and tip angles
- Stress calculation
- For multi-layer designs
  - » layer spacing
  - » gage wire selection and placement
- What-ifs

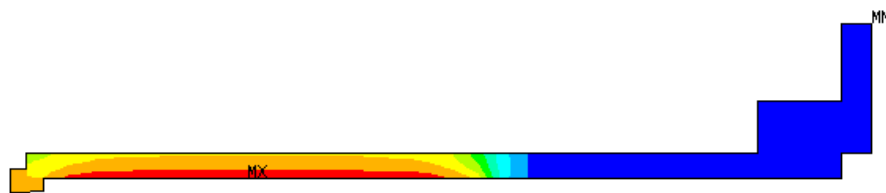
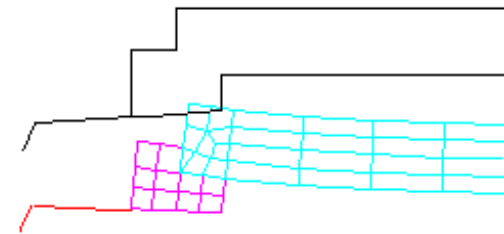
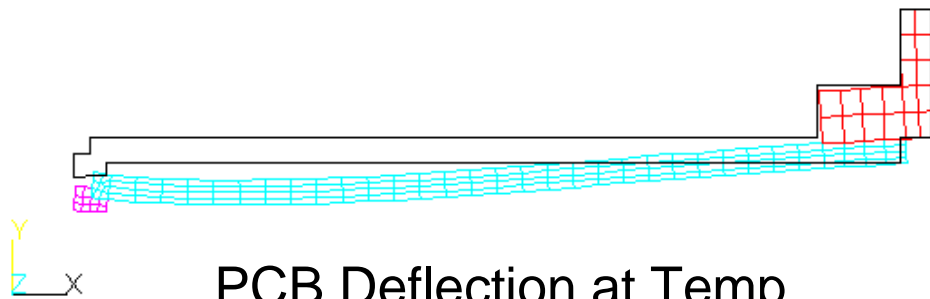


# Probe Characterization





# High Temp FEA



```
ANSYS 5.2  
DEC 1 1996  
16:18:57  
PLOT NO. 1  
NODAL SOLUTION  
STEP=2  
SUB =10  
TIME=600  
TEMP  
TEPC=8.893  
SMN =27  
SMX =65.321  
27  
31.258  
35.516  
39.774  
44.032  
48.29  
52.548  
56.805  
61.063  
65.321
```

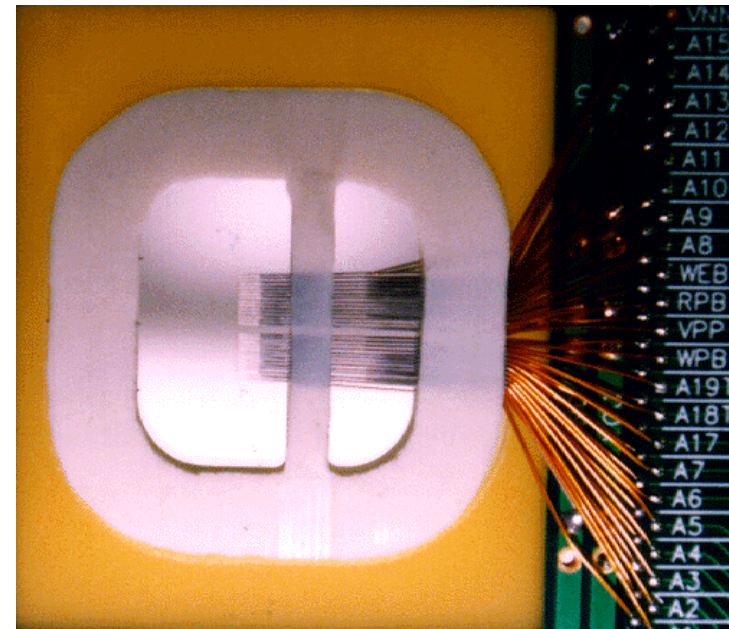






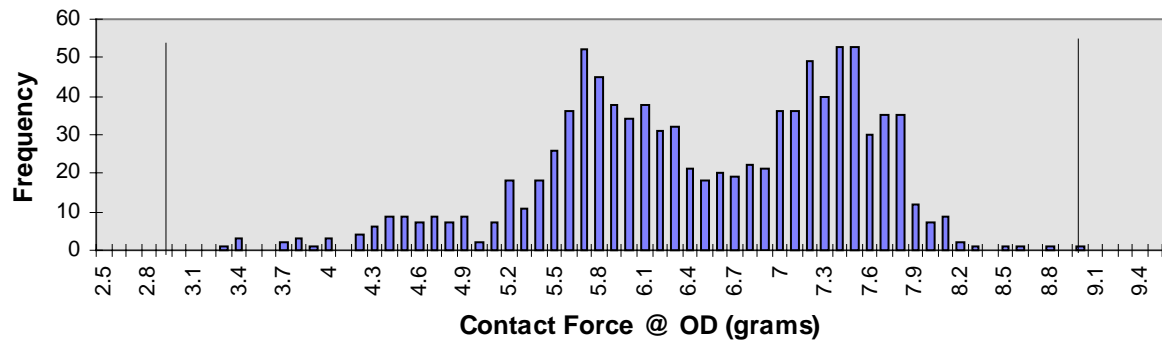
# Innovative Ring Design

- Custom contours for BCF
- Bridge supports for multiple rows
- Inriggers/outriggers
- Multiple-piece rings
- Composite rings
- Blind apertures
- Integral stiffeners
- 3-D solids modeling, direct download to CNC for manufacturing

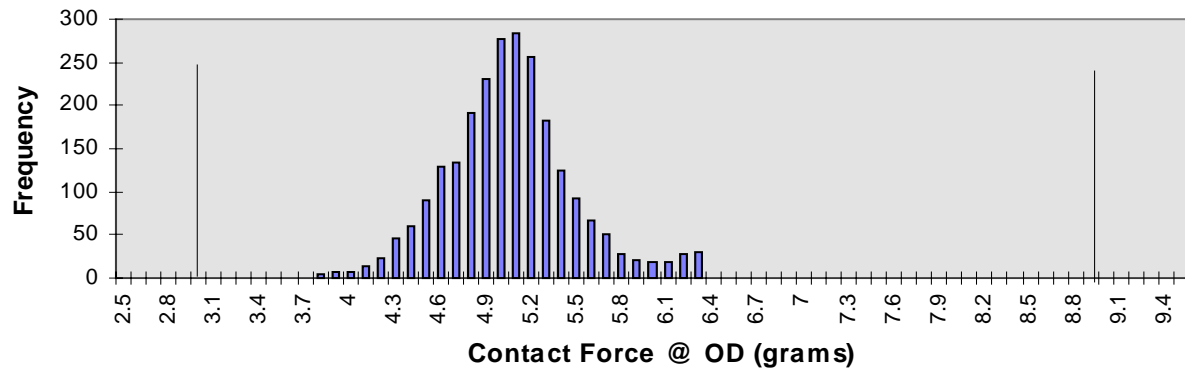


# Contact Force Example

Old Design Histogram

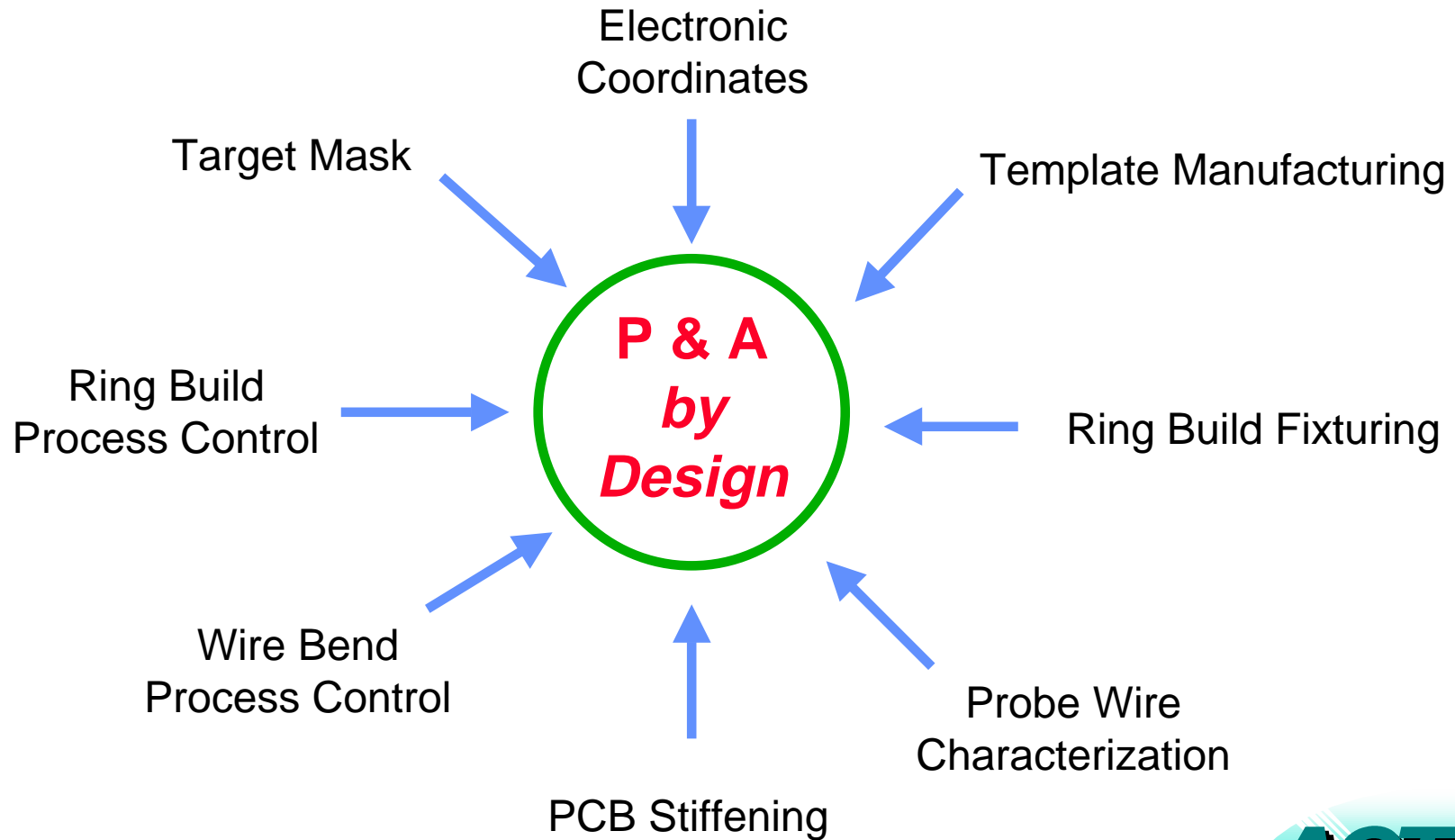


New Design Histogram





# Planarity & Alignment

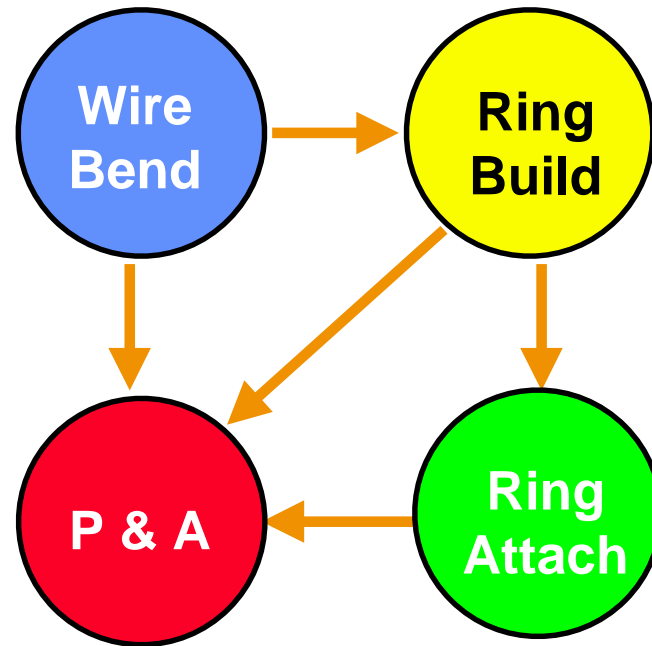




# Process Control

Wire Diameter  
Etch Profile  
Bend Angle  
Tip Length  
Tip Diameter

Tip Length  
Tip Diameter  
Planarity  
Alignment



Ring Feature Quality  
Beam Length  
Beam Angle

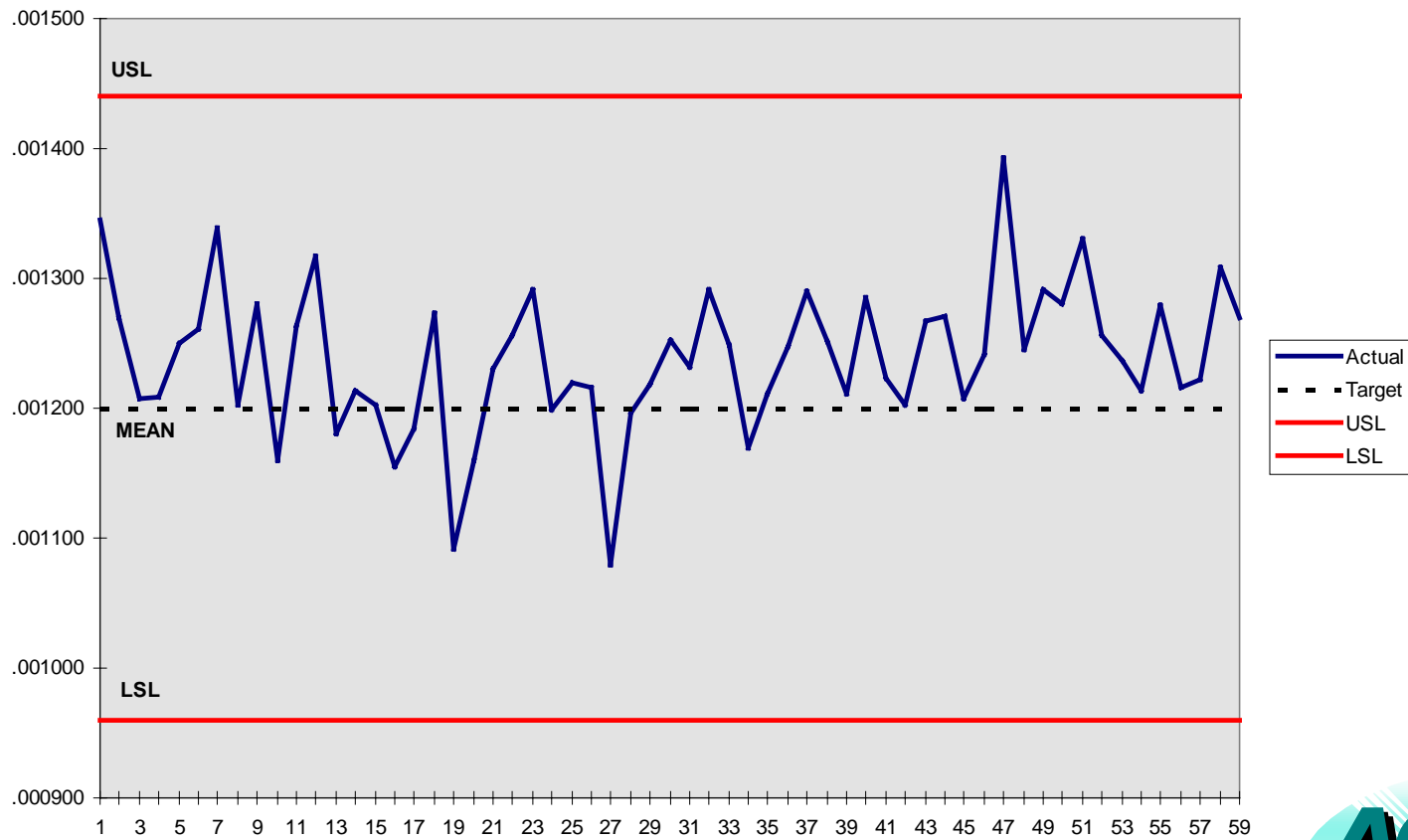
Tip Depth  
PCB Thickness  
C'bore profile  
Theta Alignment



# Process Control Example

Tip Diameter (NEW FIXTURE) TEMPE

Cpk = 1.189 & Cp = 1.421



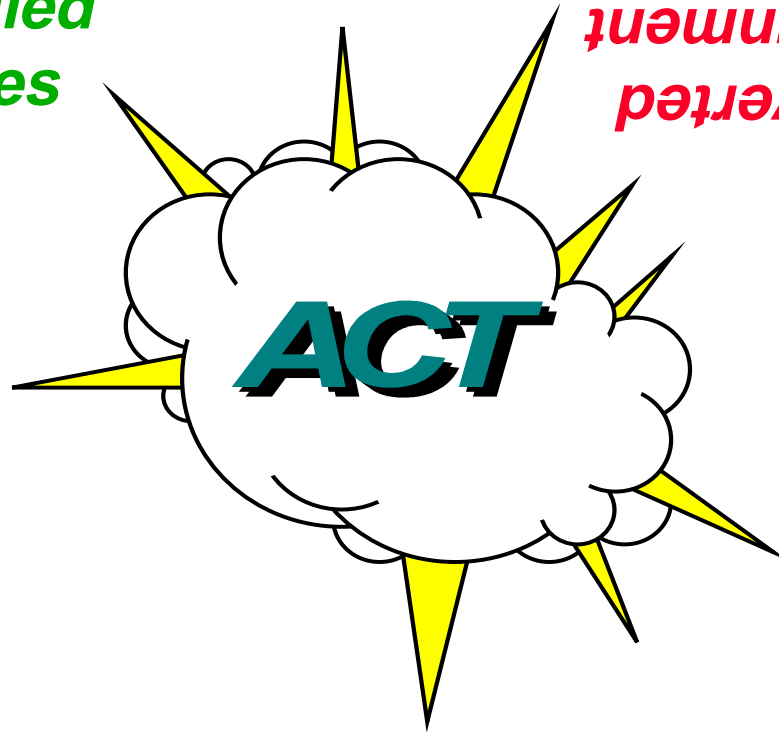


# Enabling Technologies

*Laser-drilled  
Templates*

*Inverted  
Alignment  
Capability*

*Large Array  
Process  
Equipment*



*Advanced  
Statistical  
Analysis*

*State-of-the-Art  
Calibration System*



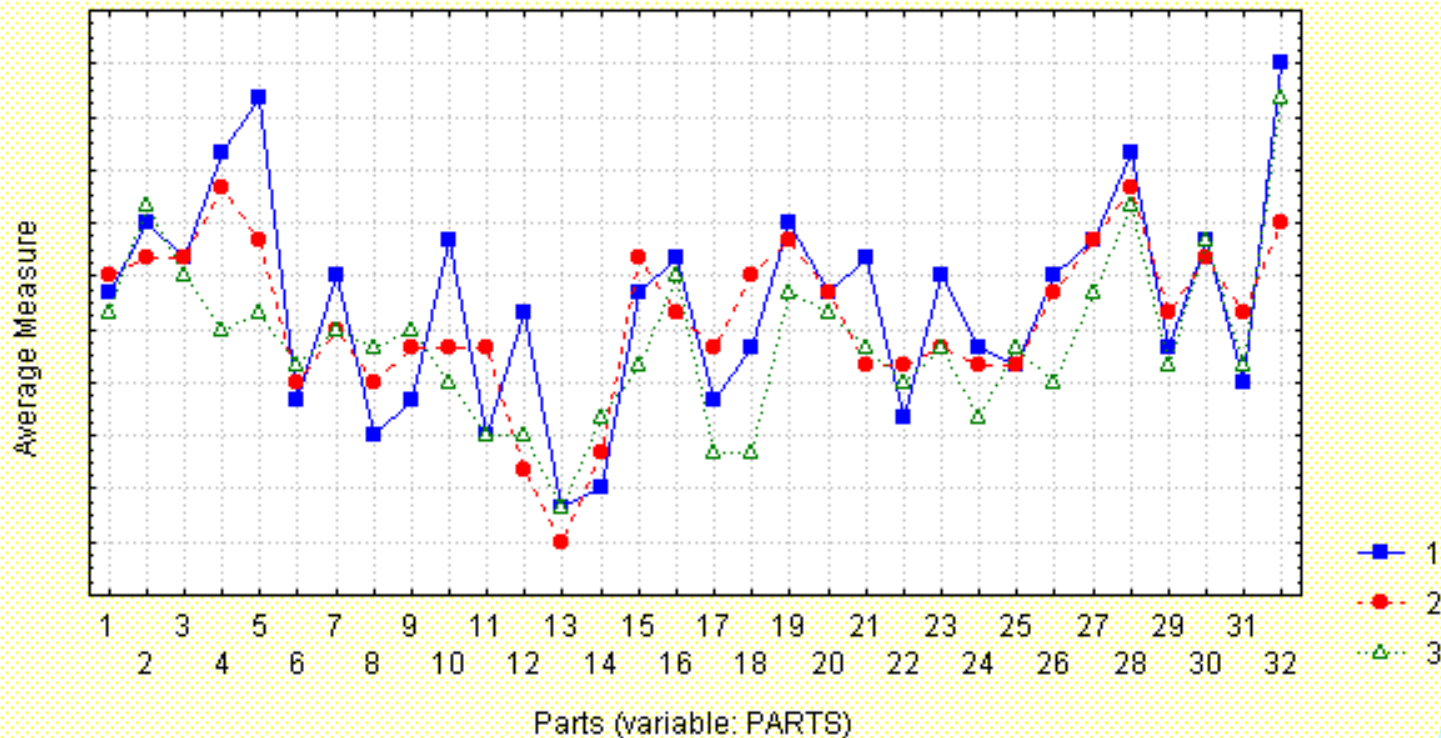
# Measurement Statistics

Plot of Average Measurements by Operator and Part

No. of Operators: 3 (variable: OPERATOR)

No. of Parts: 32 (variable: PARTS)

No. of Trials: 3 (variable: TRIALS)



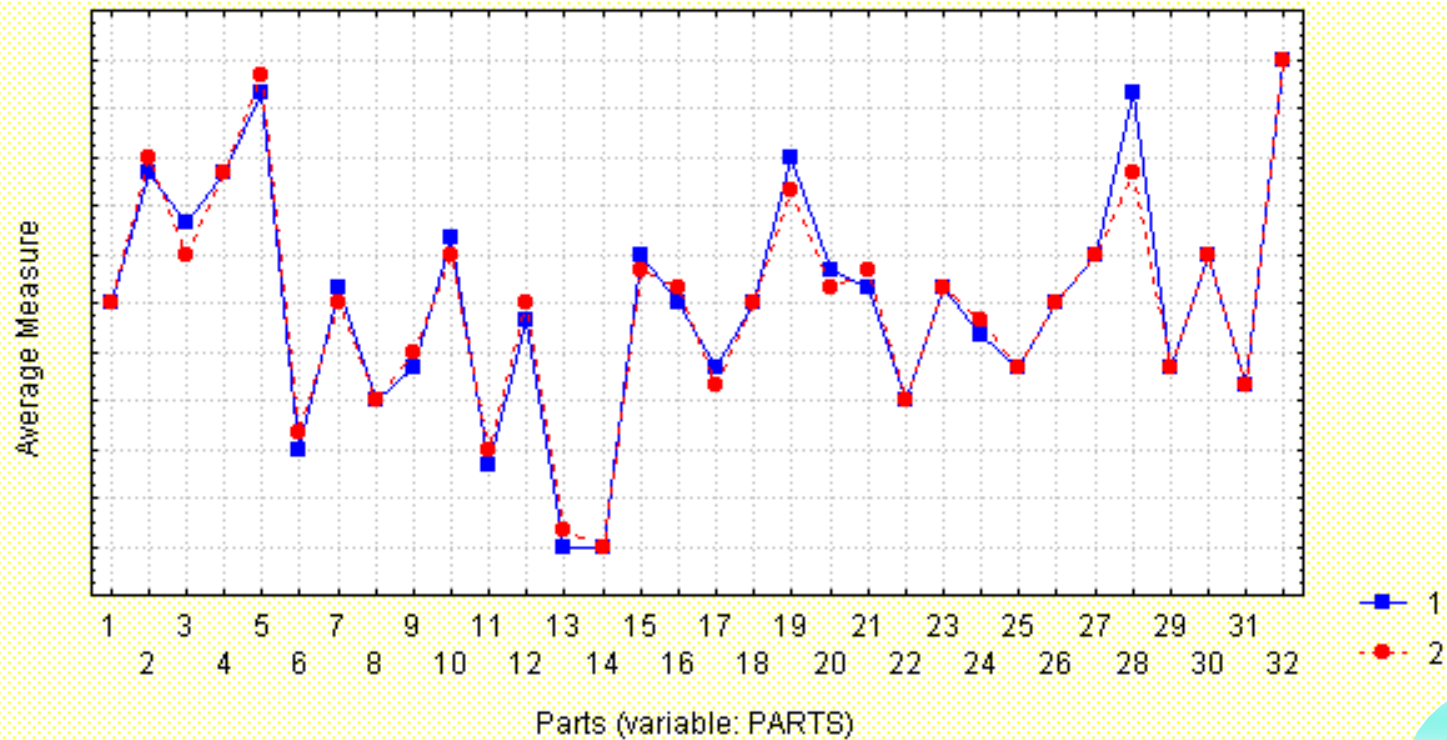
# Measurement Statistics

Plot of Average Measurements by Operator and Part

No. of Operators: 2 (variable: OPERATOR)

No. of Parts: 32 (variable: PARTS)

No. of Trials: 3 (variable: TRIALS)

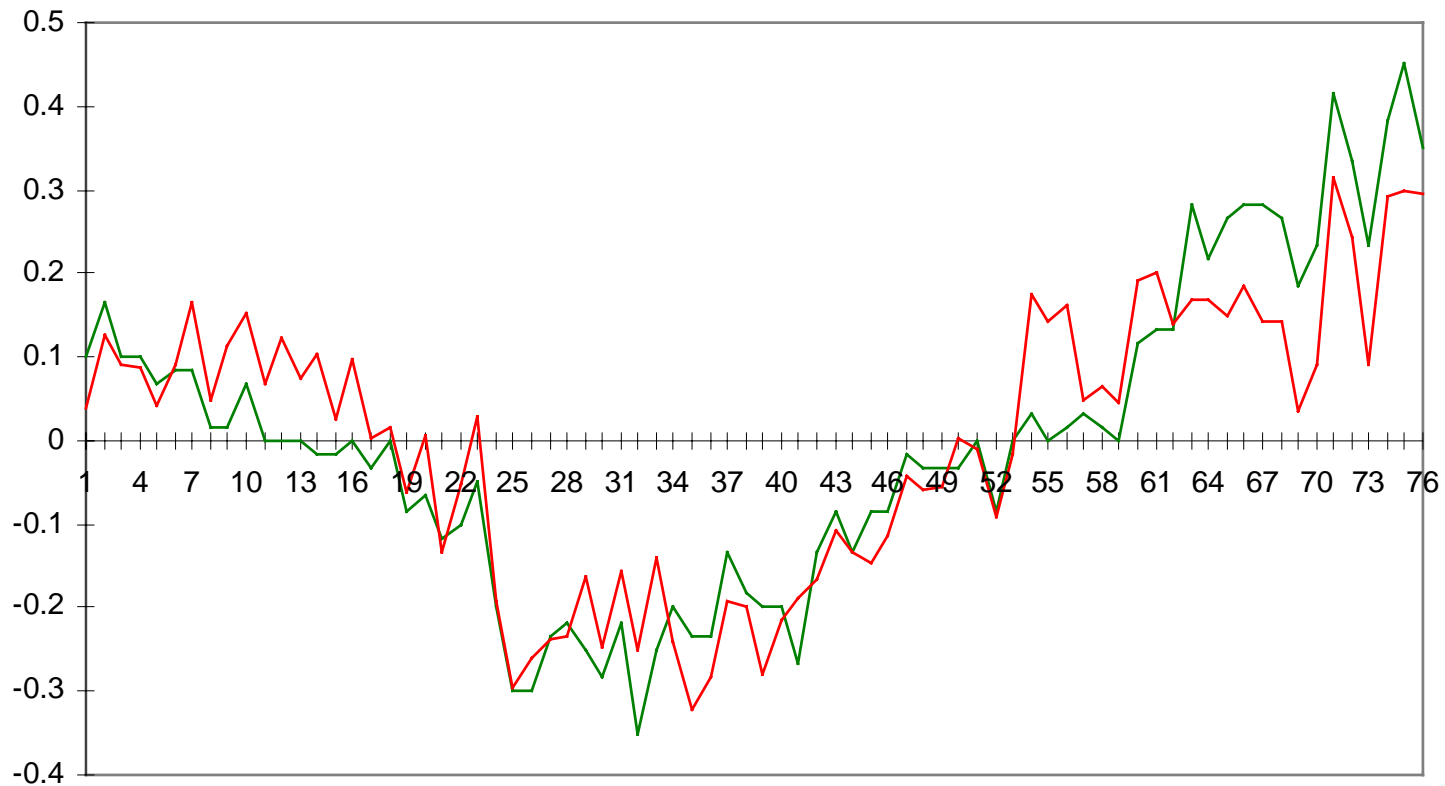






# Statistical Analysis Example

## "Y" Alignment Comparison Before/After 84K Touchdowns



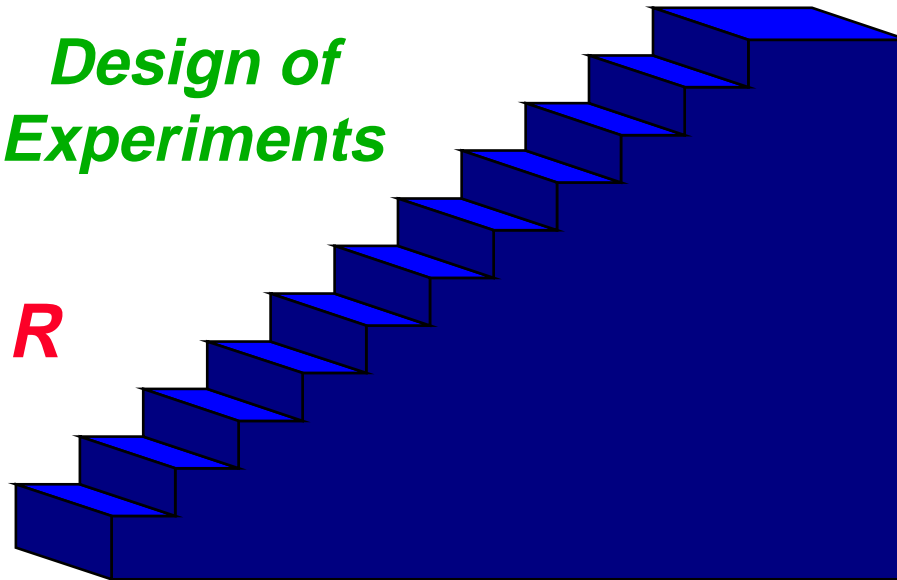


# *Role of Statistics*

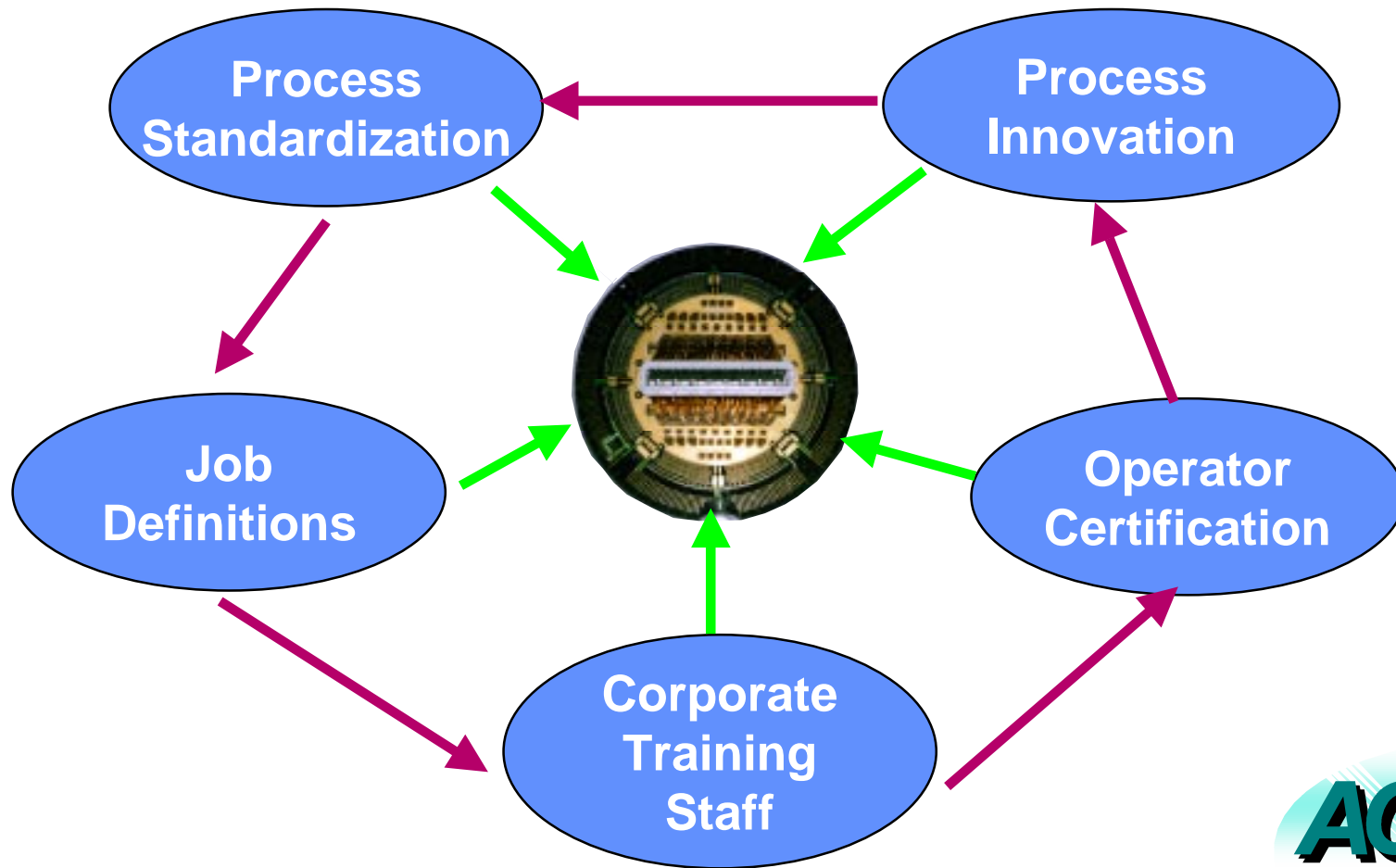
*True Statistical  
Process Control*

*Design of  
Experiments*

*Gage R & R  
Studies*



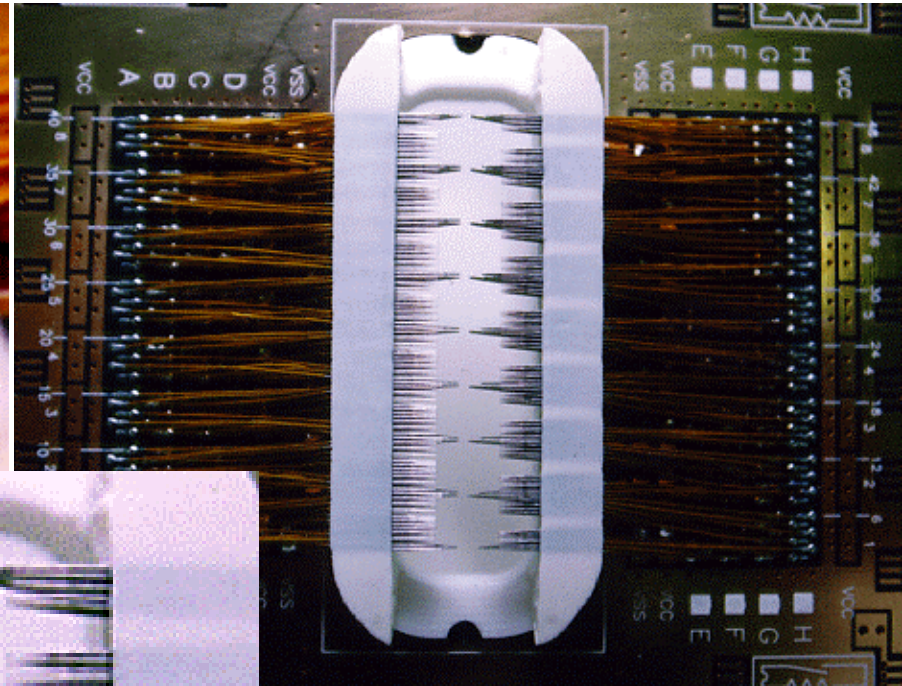
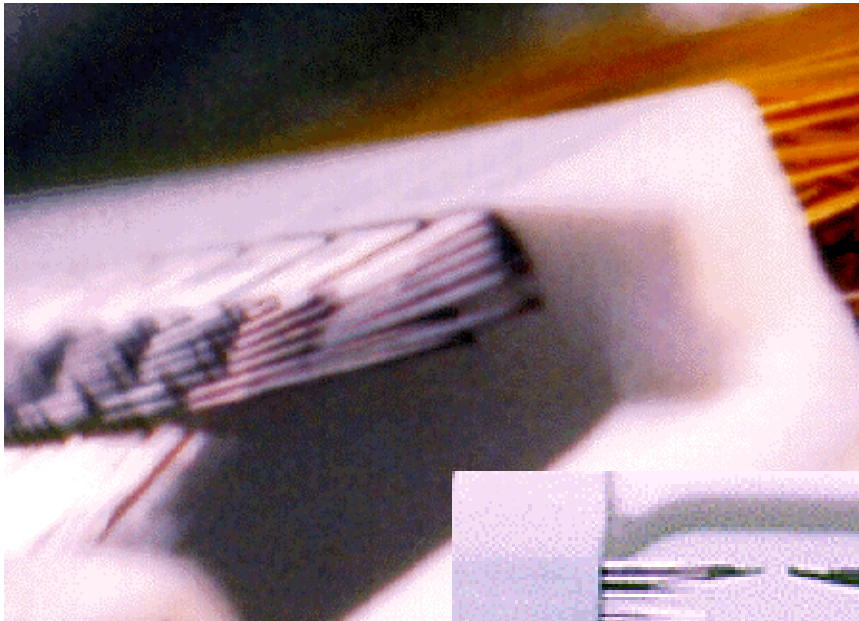
# Operator Training





CERPROBE

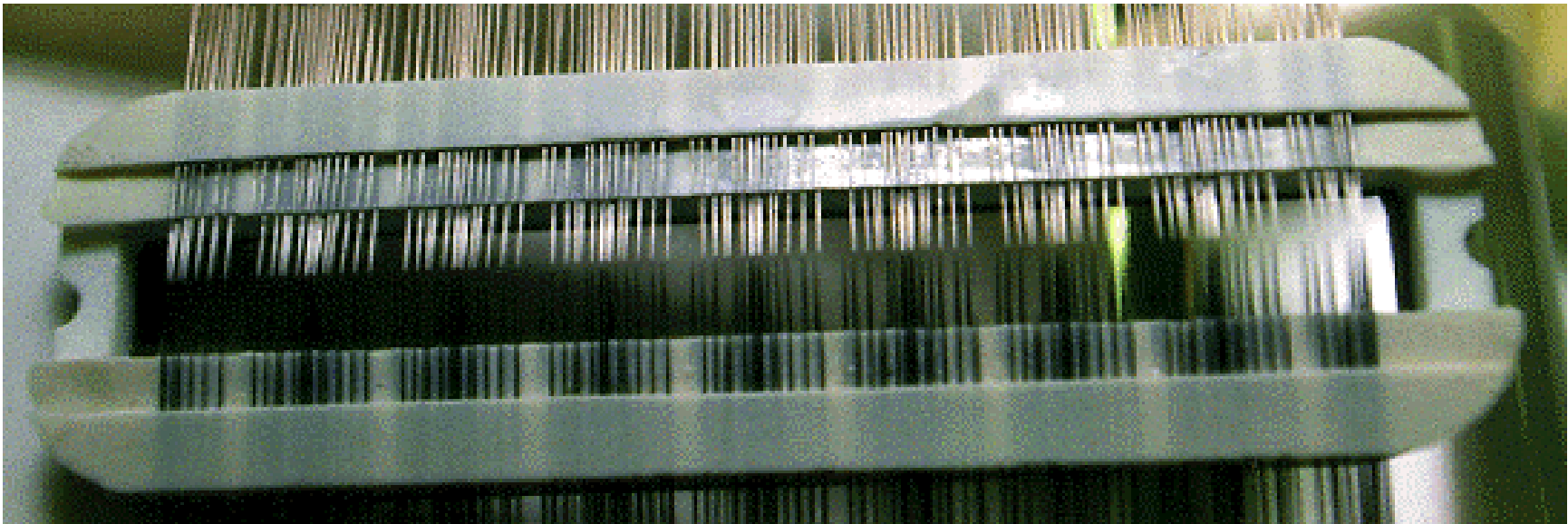
# The Results



**9-layer  
16-DUT  
Memory Card**



# *The Results*

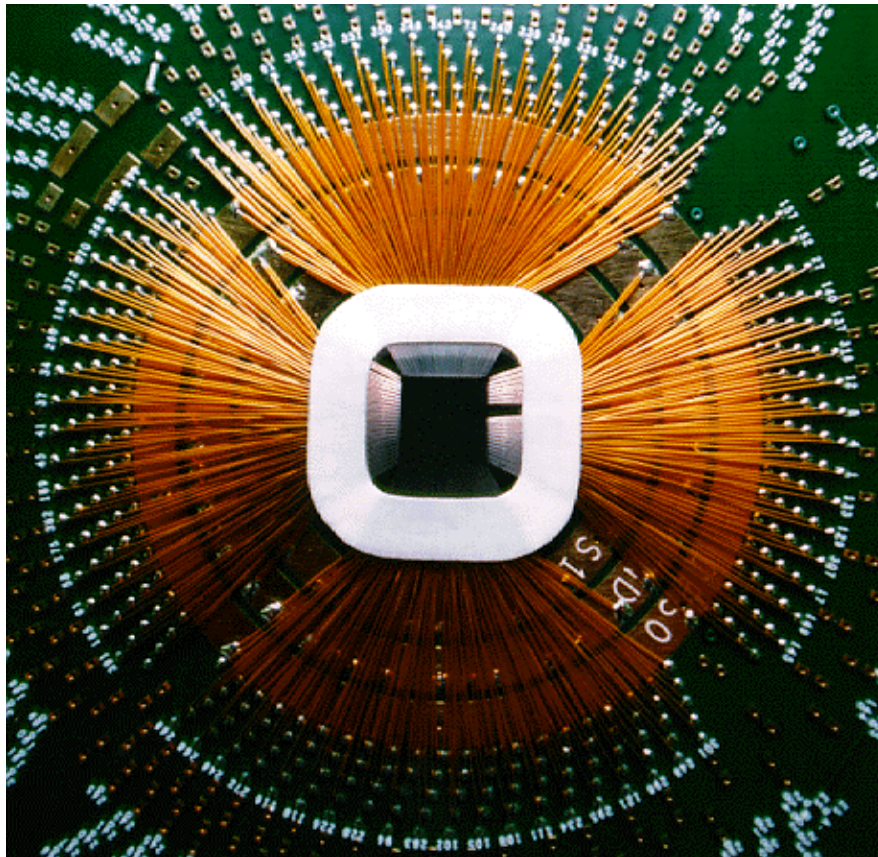


**2 x 8 Memory Card**  
**4 rows of bond pads**



CERPROBE

# *The Results*



**60  $\mu$  m pitch**  
**480 probes**  
**1.2 g/mil BCF**

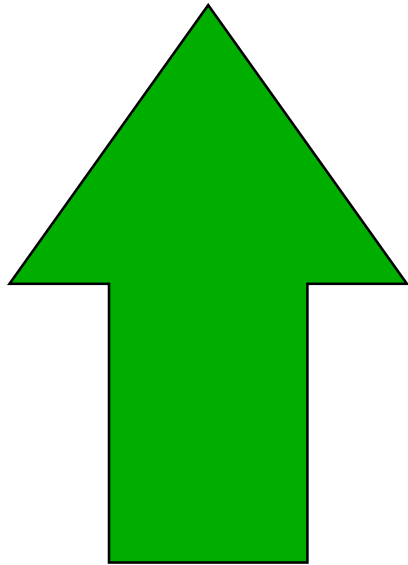






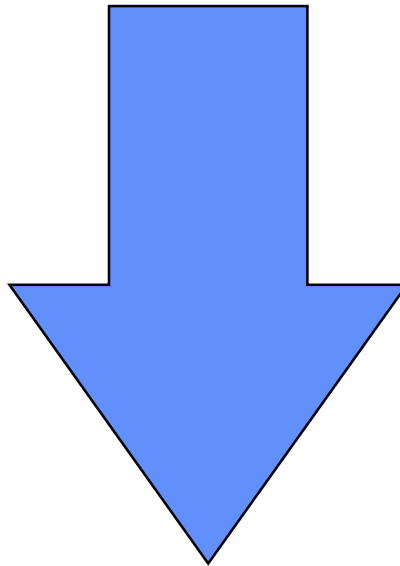
# *The Immediate Future*

8x4 Array  
2272 probes



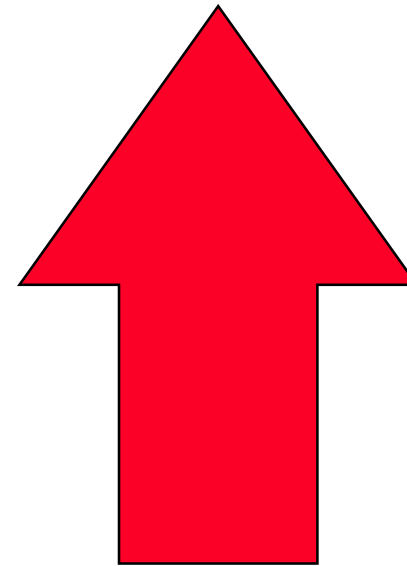
*Large Array  
Multi-DUT*

*Tight Pitch*



50  $\mu\text{m}$  pitch  
in-line

100  $\mu\text{m}$  pitch  
125° C



*High Temp*





# *The Challenges*

