

2005 Southwest Test Workshop

COBRA FP PROBE CARD FOR MULTI-DUT LOGIC & MEMORY APPLICATIONS

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Overview

- Objective :
 - Offer to the market a vertical probing solution
 - for fine pitch (down to 80 μm)
 - for Multi-DUT Logic & Memory applications
- Content :
 - Cobra FP probe card description
 - Alpha & Beta test results / Probe Card capabilities

Where are we today ?

- Today's Capability :
 - 105 μm pitch
 - 60 X 60 μm^2 pad size
 - High Temperature (HT)

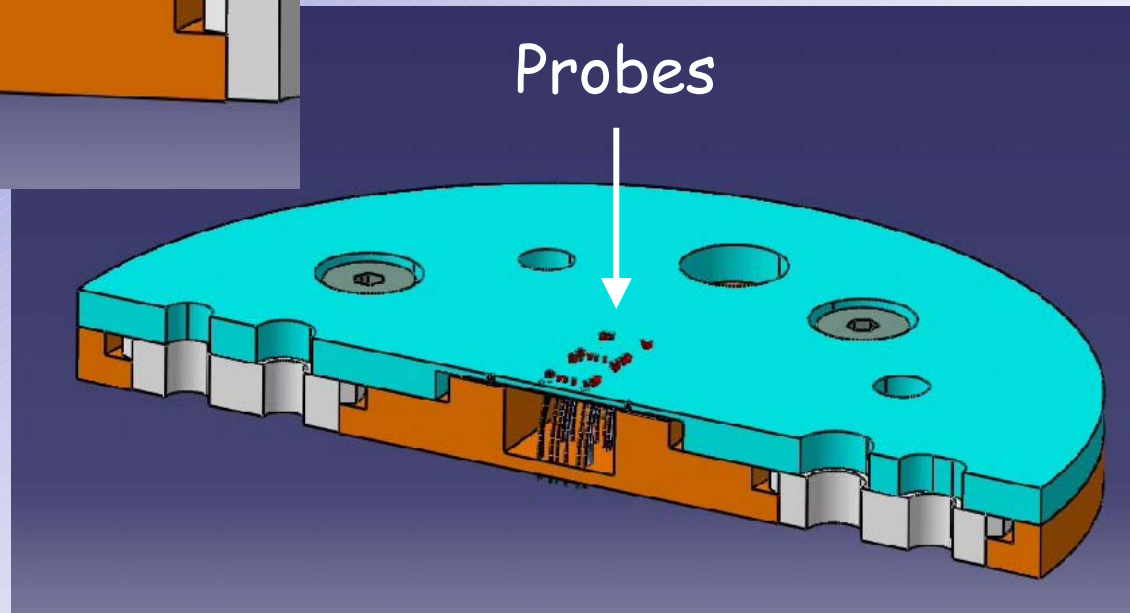
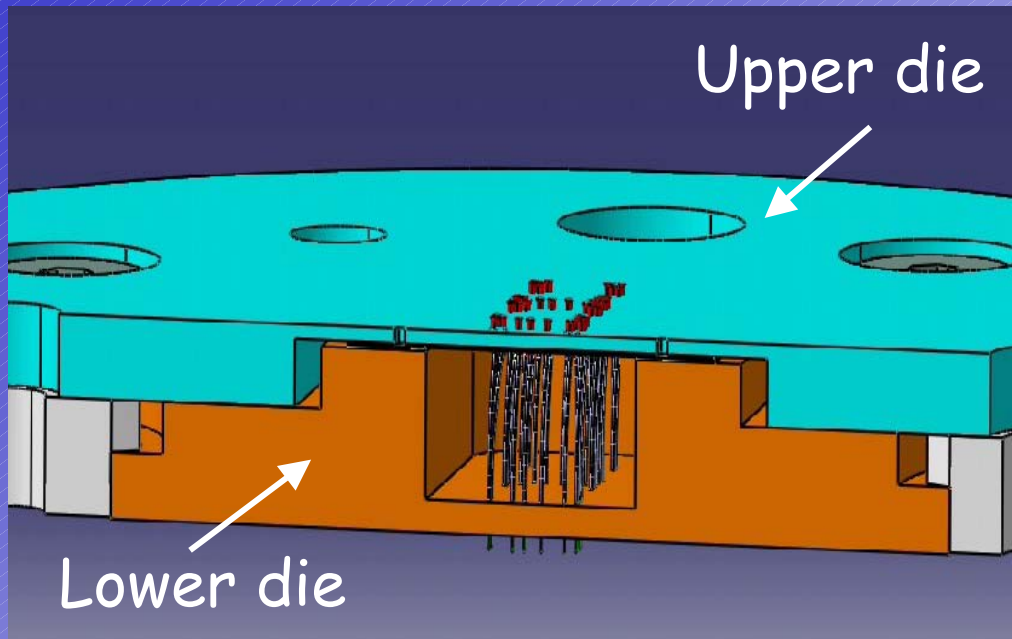
New Customer needs

- Finer pitch
- Smaller pad size
- Lower contact force (POAA)
- HT

→ **Cobra Fine Pitch**

Keeping same advantages of Standard Cobra such as
Field Replaceable PH & Repairable PH (Probe Head)

Cobra FP Description - Probe Head



Cobra FP Description - PH Material

- Full Ceramic concept to fit :
 - High Temp needs : up to 150°C
 - Tight alignment < 0.5 mils radius
 - Small planarity window < 1 mil



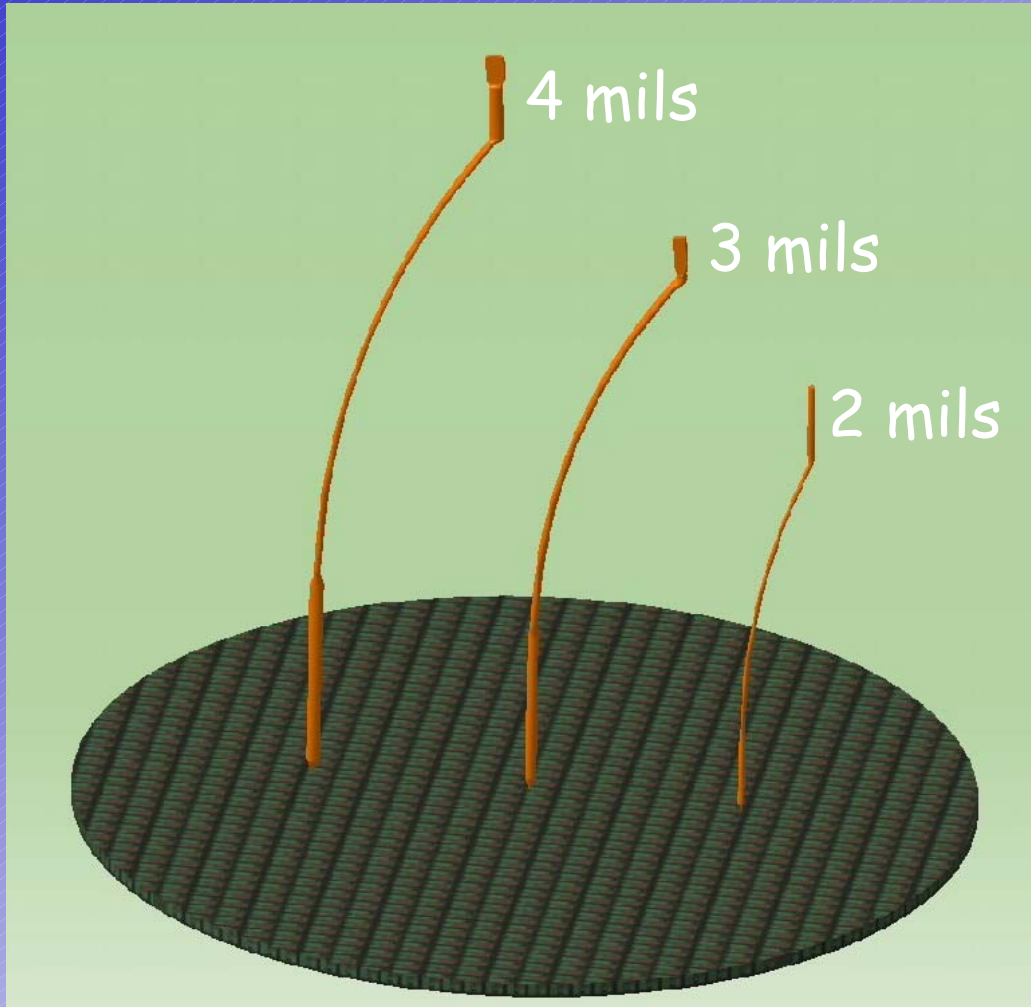
Upper die



Lower die

→ Implementation of a new ceramic : UP200

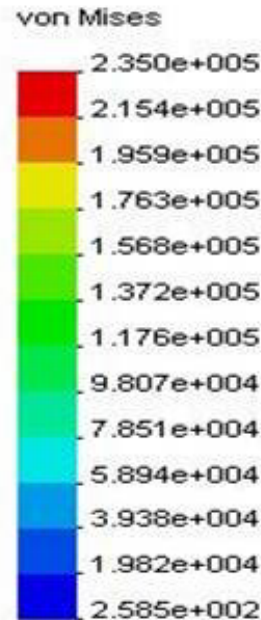
Cobra FP Description - Probe



- Diameter : 2 mils
- Material : P7
- Tip shape : pointed or flat

Cobra FP Description FEA result

Simulation with
Non-linear COSMOS



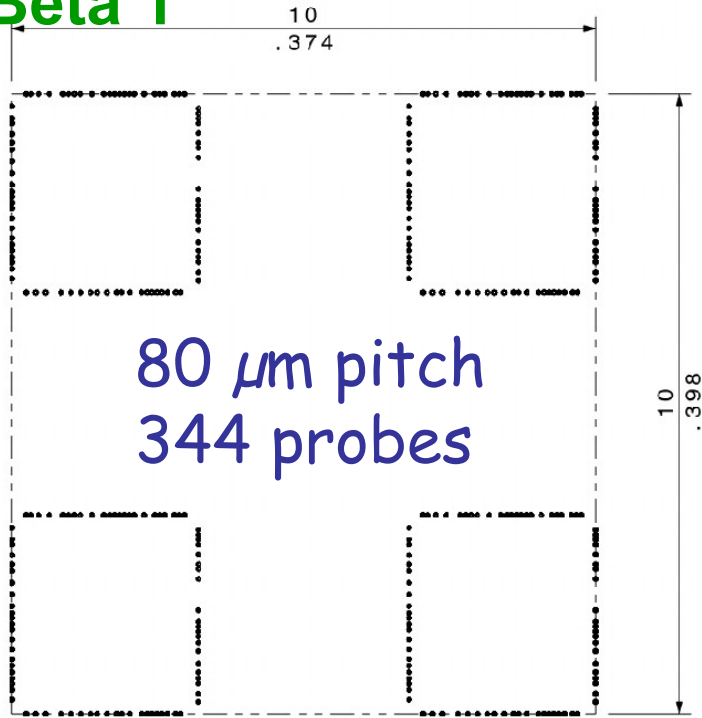
- Von Mises (psi)
- 4 mils Overdrive (OD)

Cobra FP - Probe Head Config' limit

- Multi DUT Pad configurations :
 - in line / peripheral layout down to 80 μm
 - some 4 sides full peripheral may be limited to 90 μm
- Every customer request requires a feasibility study prior to committment
- Skip die configuration may be proposed

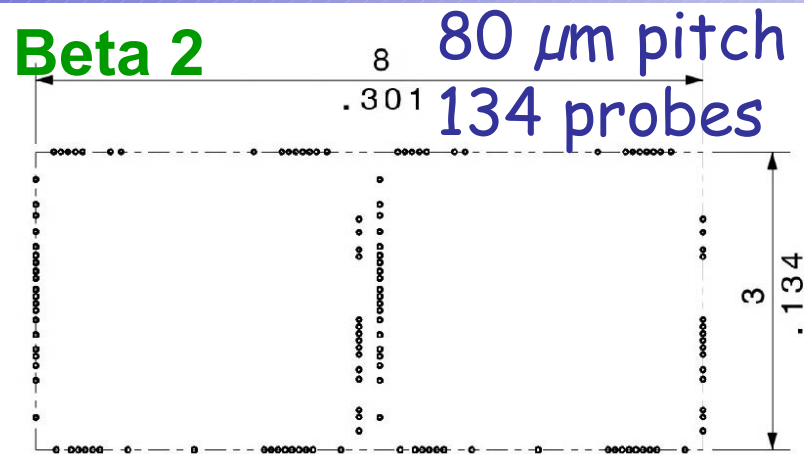
Probe Card Design Exemple Delivered

Beta 1

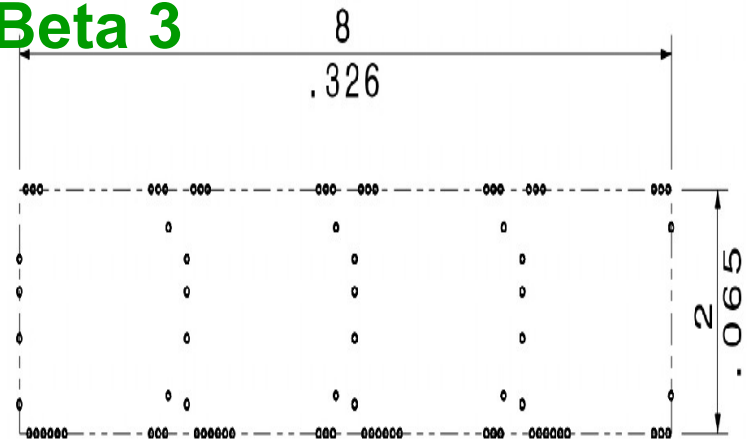


Skip design

Beta 2

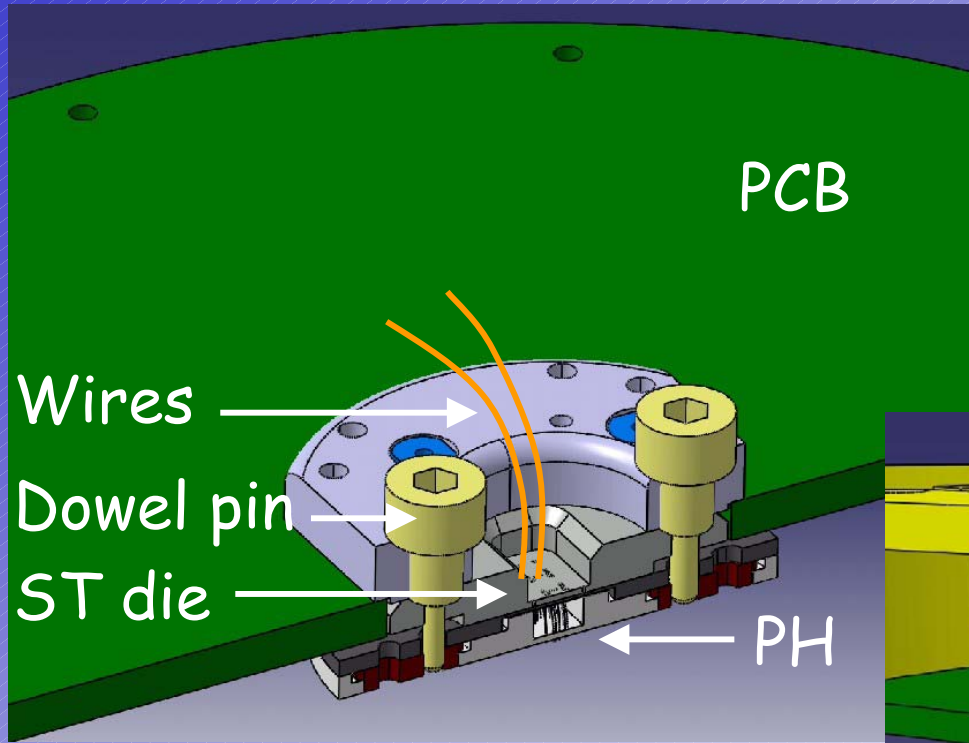


Beta 3



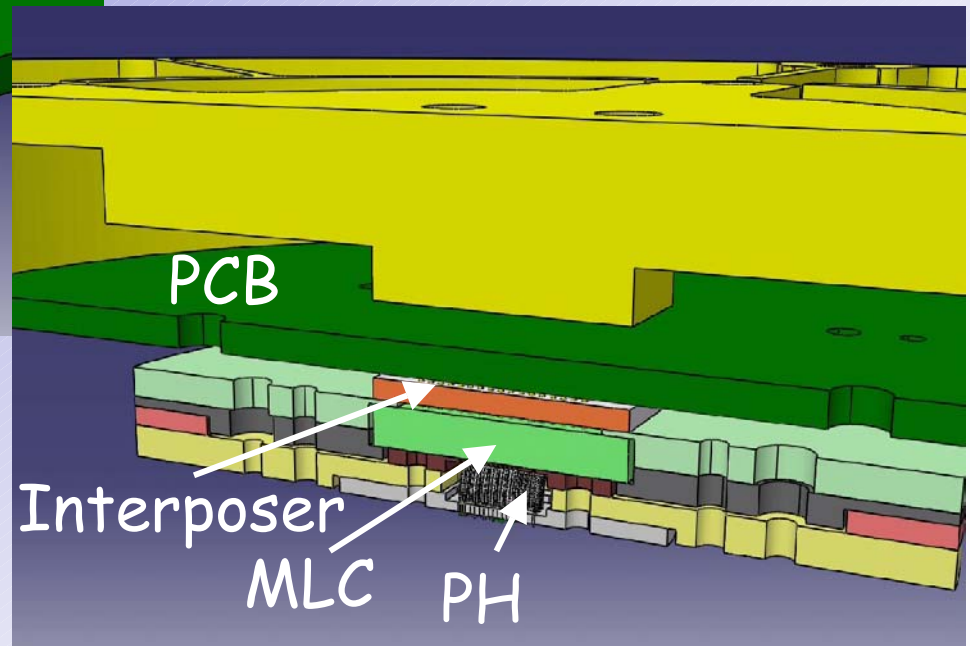
90 μm pitch
84 probes

Cobra FP Description - Space Transformer (ST)



Hand Wire ST

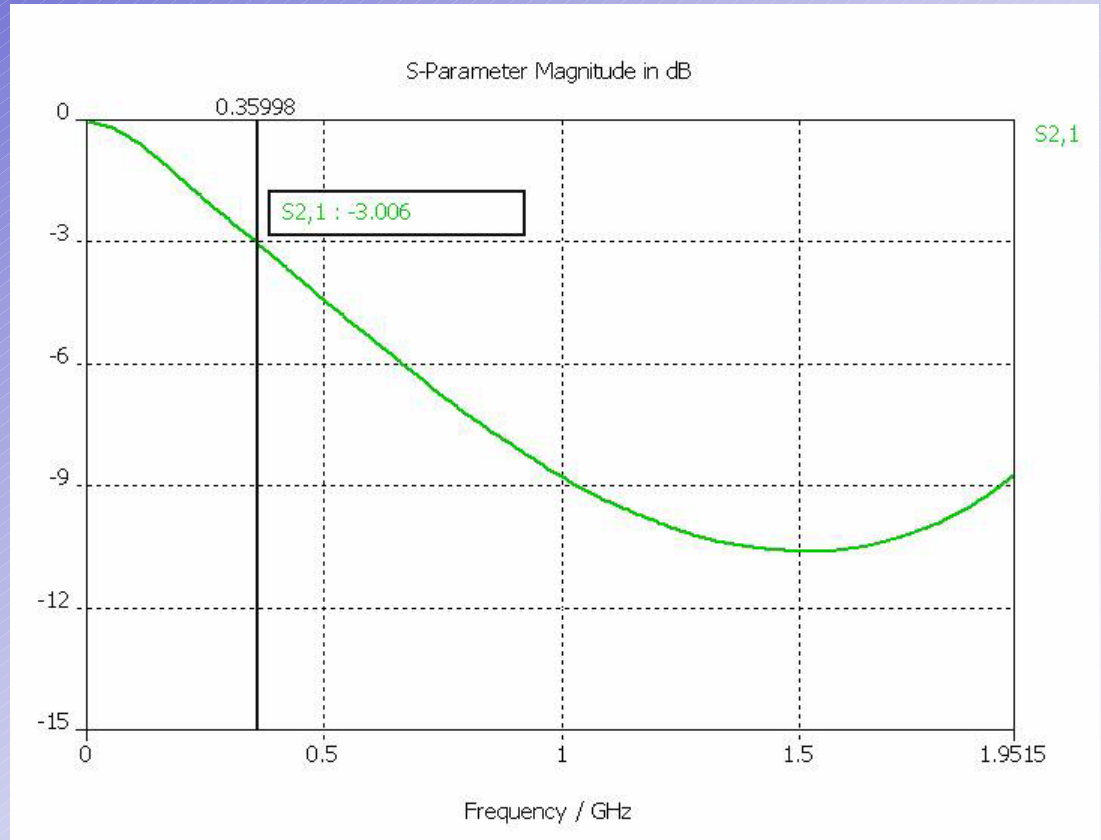
Rigid ST



Cobra FP Description - Hand Wire ST

- Hand Wire ST < 500 points

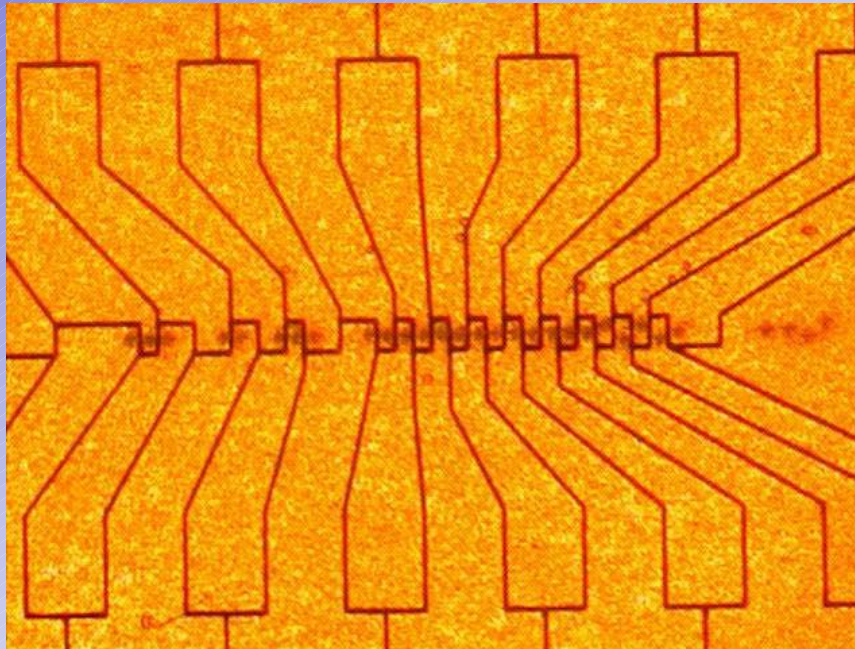
- 60 μm wire diameter



→ Bandwidth is 350 MHz @ -3dB

Cobra FP Description - Rigid ST

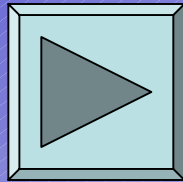
- **Rigid ST (MLC, LTCC) > 500 points & Higher Frequency**
 - Standard final layer : thin film technology
 - Enhanced final layer : gold layer laser etched down to 90 μm



Alpha test - Lifetime vs Scrub mark

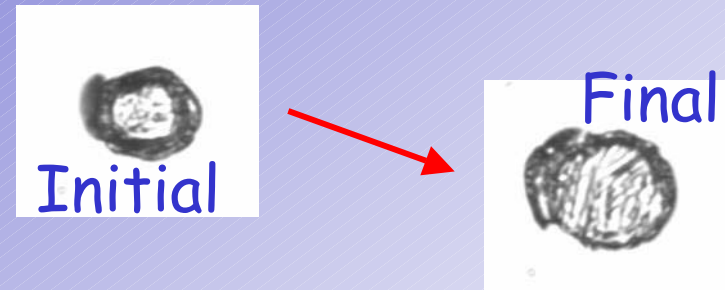
- Lifetime up to 1MTD

- Scrub marks analysis



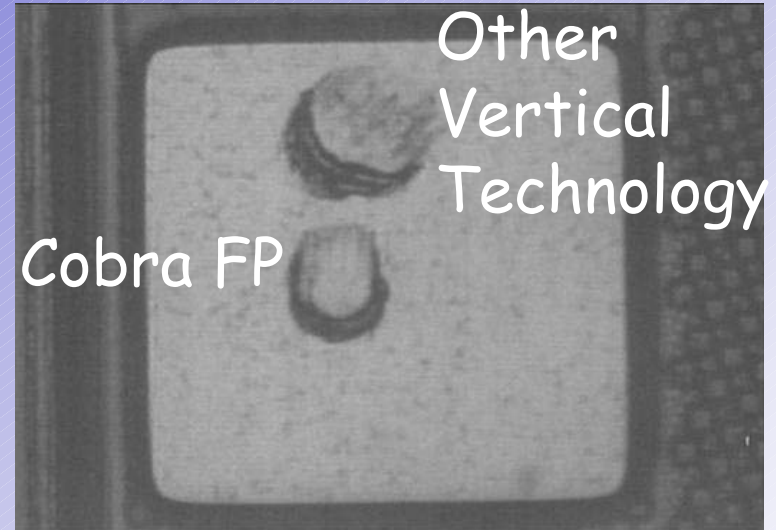
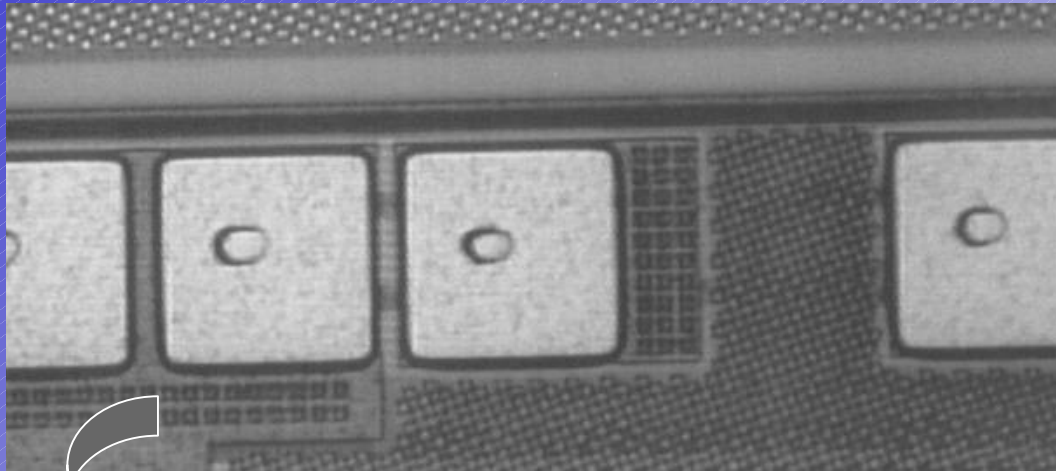
Play Video

→ Small Tip wear
after 1MTD



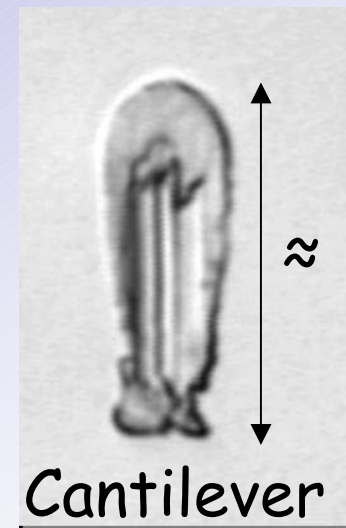
<i>3 mils OD</i>	Length (mils)	Width (mils)
Initial	0.42	0.53
After 1M TD	0.72	0.79
<i>4 mils OD</i>	Length	Width
Initial	0.54	0.67
After 1M TD	0.66	0.81

Beta test - Scrub marks @ 3 mils OD



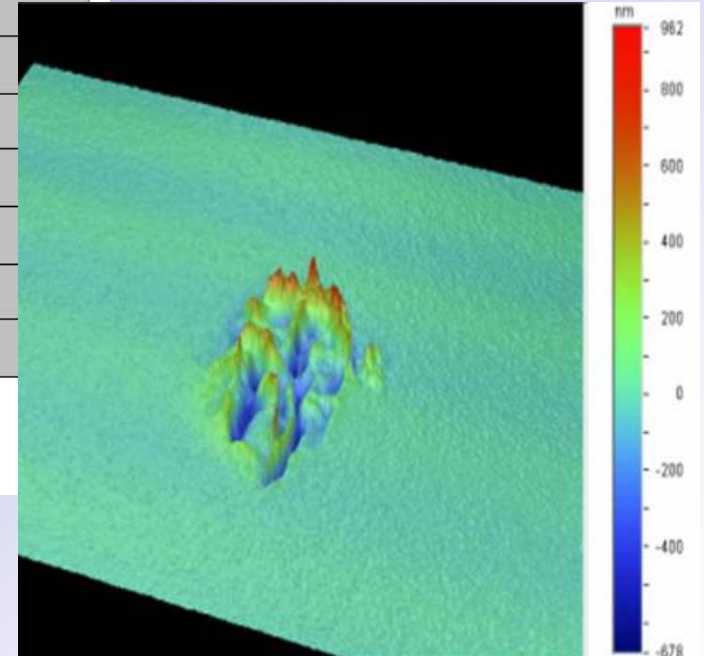
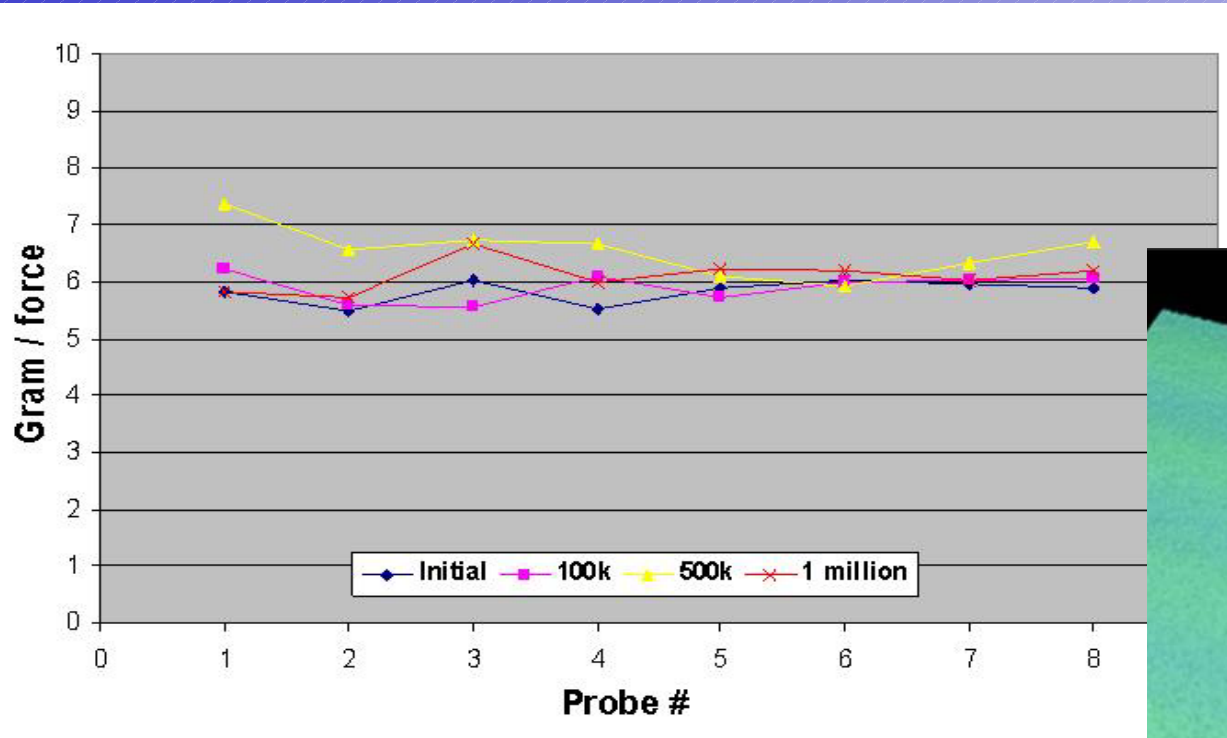
Pad size = $65 \mu\text{m}^2$
Scrub mark diameter ≈ 0.5 mils

- Small pad size capabilities
- Low K capabilities



Cantilever

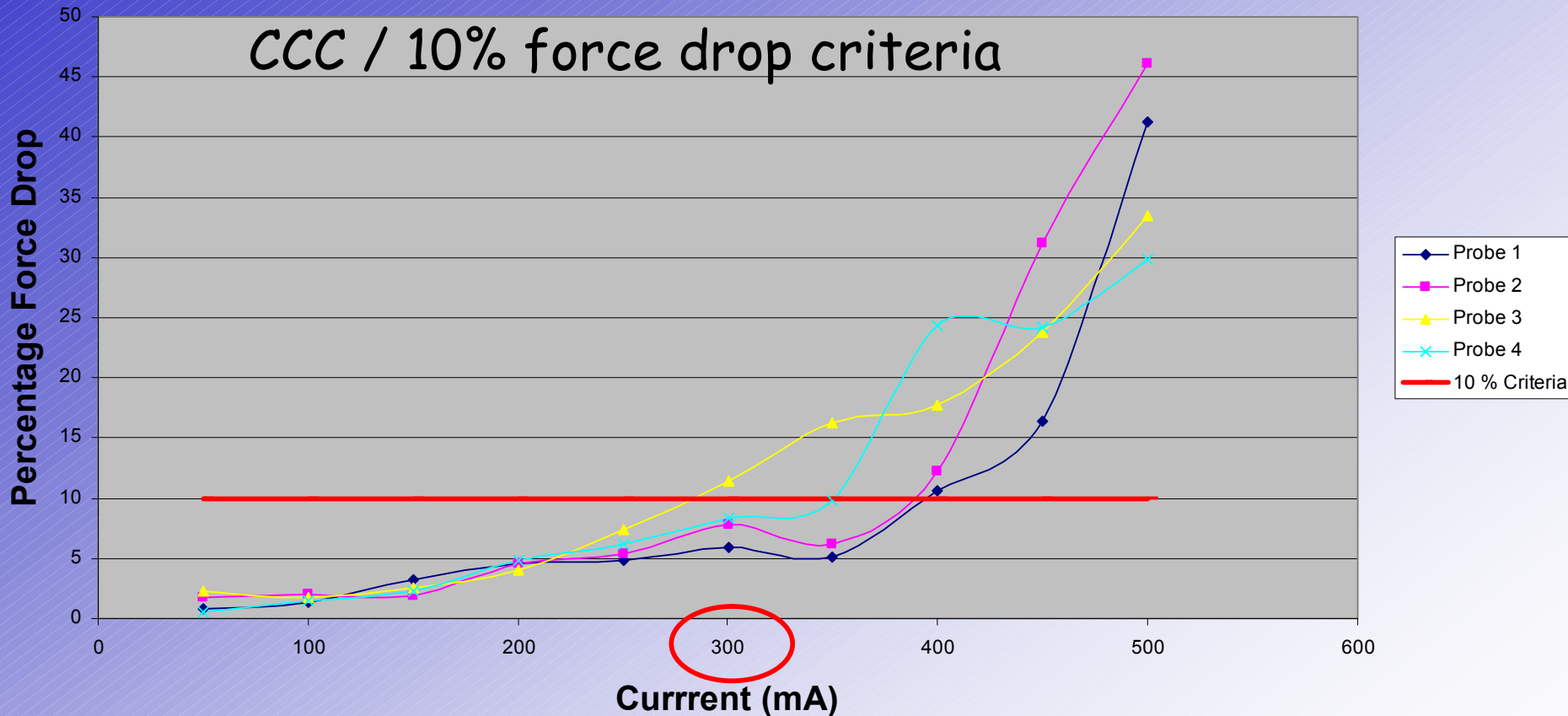
Alpha test - Gram force vs OD



- BCF \approx 6.5 g @ 3 mils OD
- Scrub depth \leq 0.4 μ m

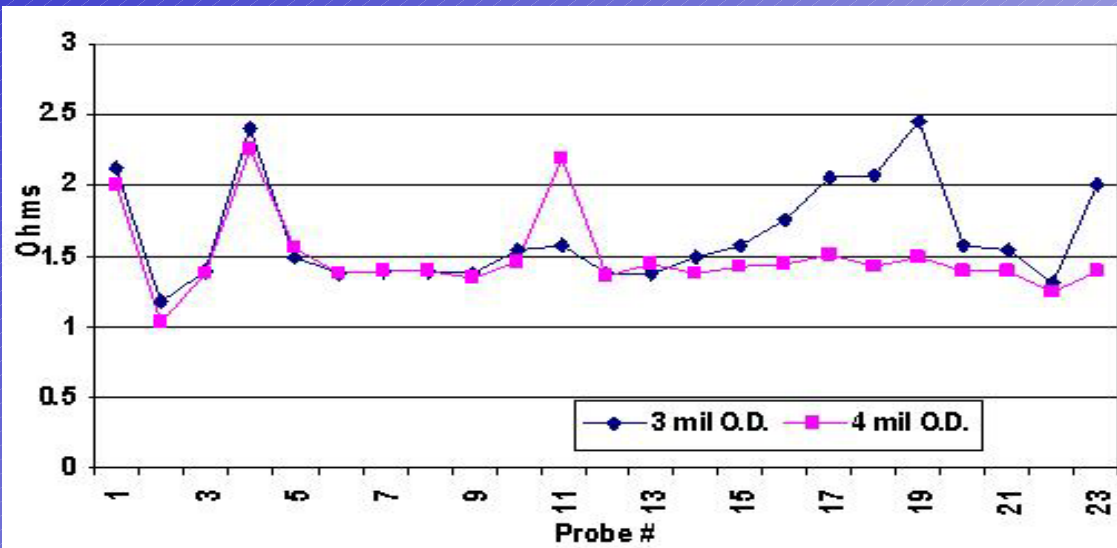
Probing Over Active Area

Alpha test - Current Carrying Capability



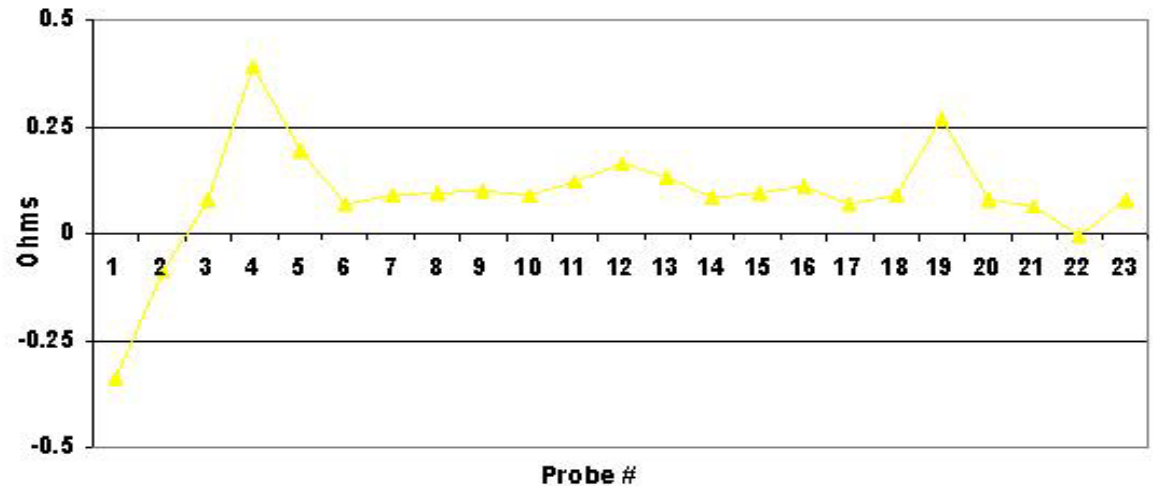
Current Carrying Capability = 300 mA

Alpha test - Trace Res / Contact Res



→ Trace Res < 2.5 Ω
@ 3 and 4 mils OD

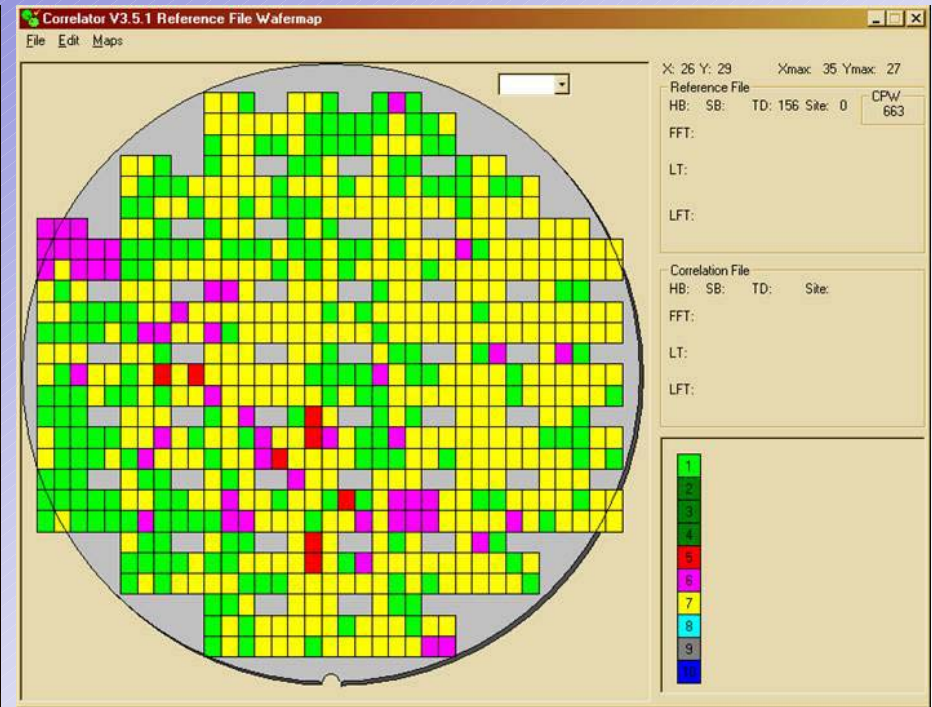
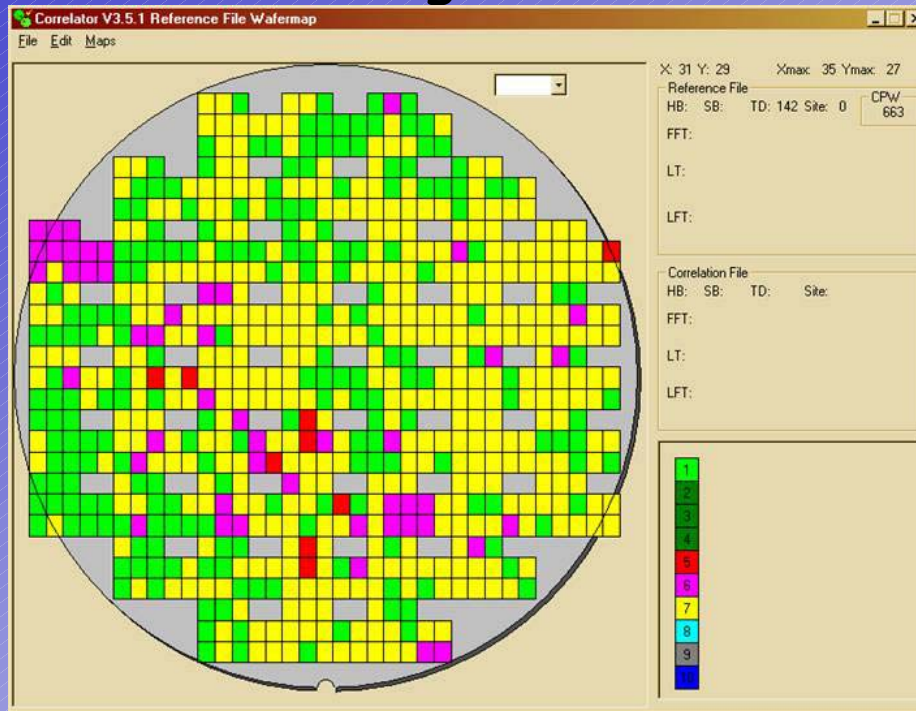
→ Cres < 0.25 Ω
@ 3 mils OD



1st results from customer floor to share



- Small Planarity window
- Good Alignment

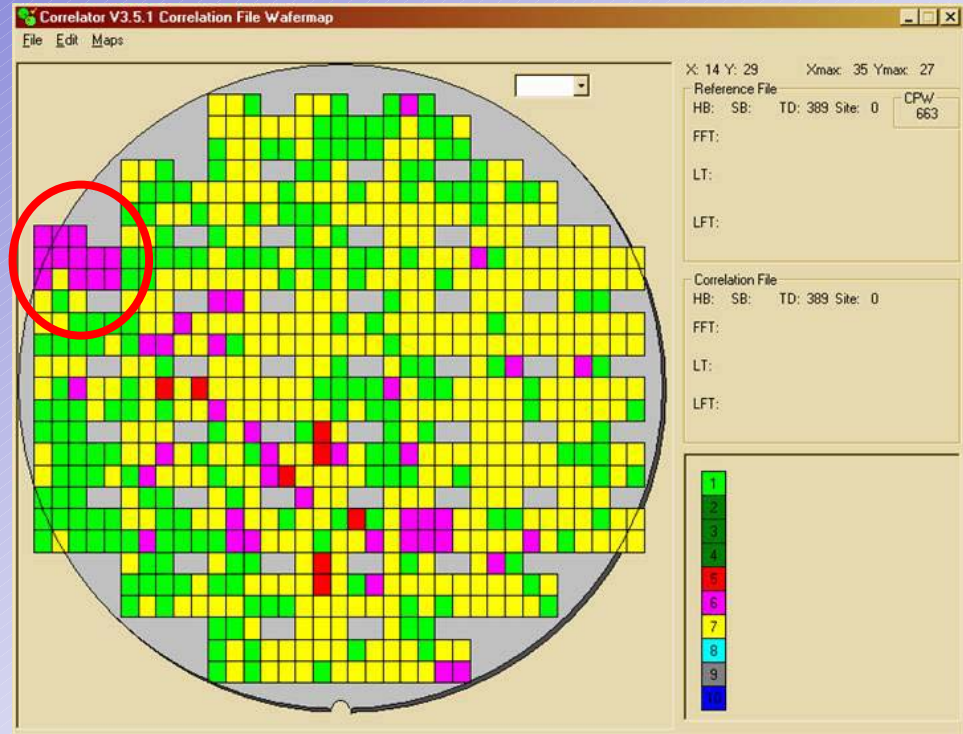
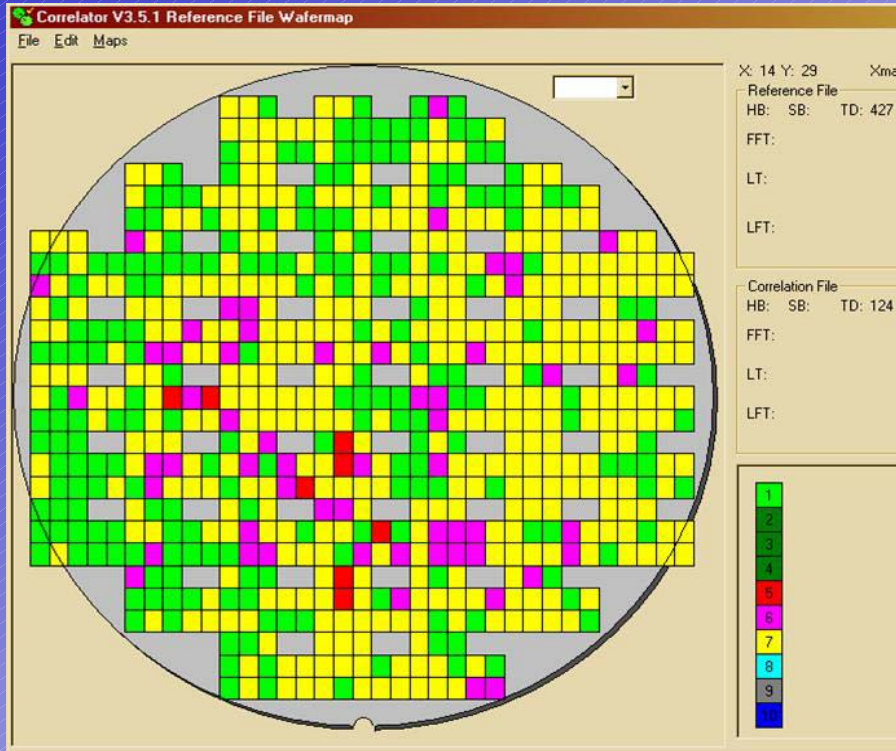


1st test

2nd test

→ Probe Head correlation : 99.4 %

1st results from customer floor to share



Other Vertical Technology

K&S Cobra Fine Pitch

→ Same Yield (beside the fingerprint)

Conclusion

- An advanced 2 mils Probe Card Technology enable 80 μm fine pitch probing
- It keeps the advantages of conventional Cobra : repairability & possibility of 100% probe replacement
- Higher pin count & higher parallelism is coming for more multi DUT applications

Acknowledgements

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ANY QUESTIONS ?