

SWT - 2003



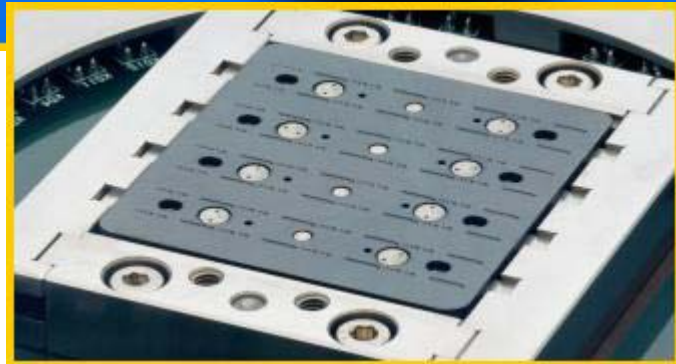
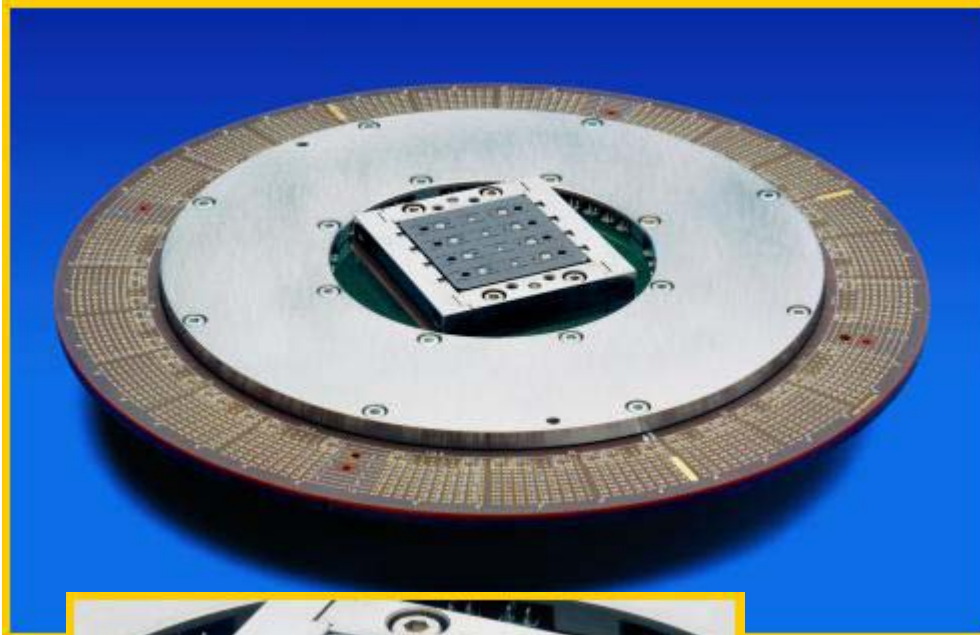
FEINMETALL GmbH
Reliable Contacts are our Business

“Memory XXL “
Another Step on the Way
to Full Wafer Probing
- 256 DUT on Beta-mode -

by Klaus Giringer and Gunther Boehm

June 2nd 2003

Here we are... The ViProbe® Status!

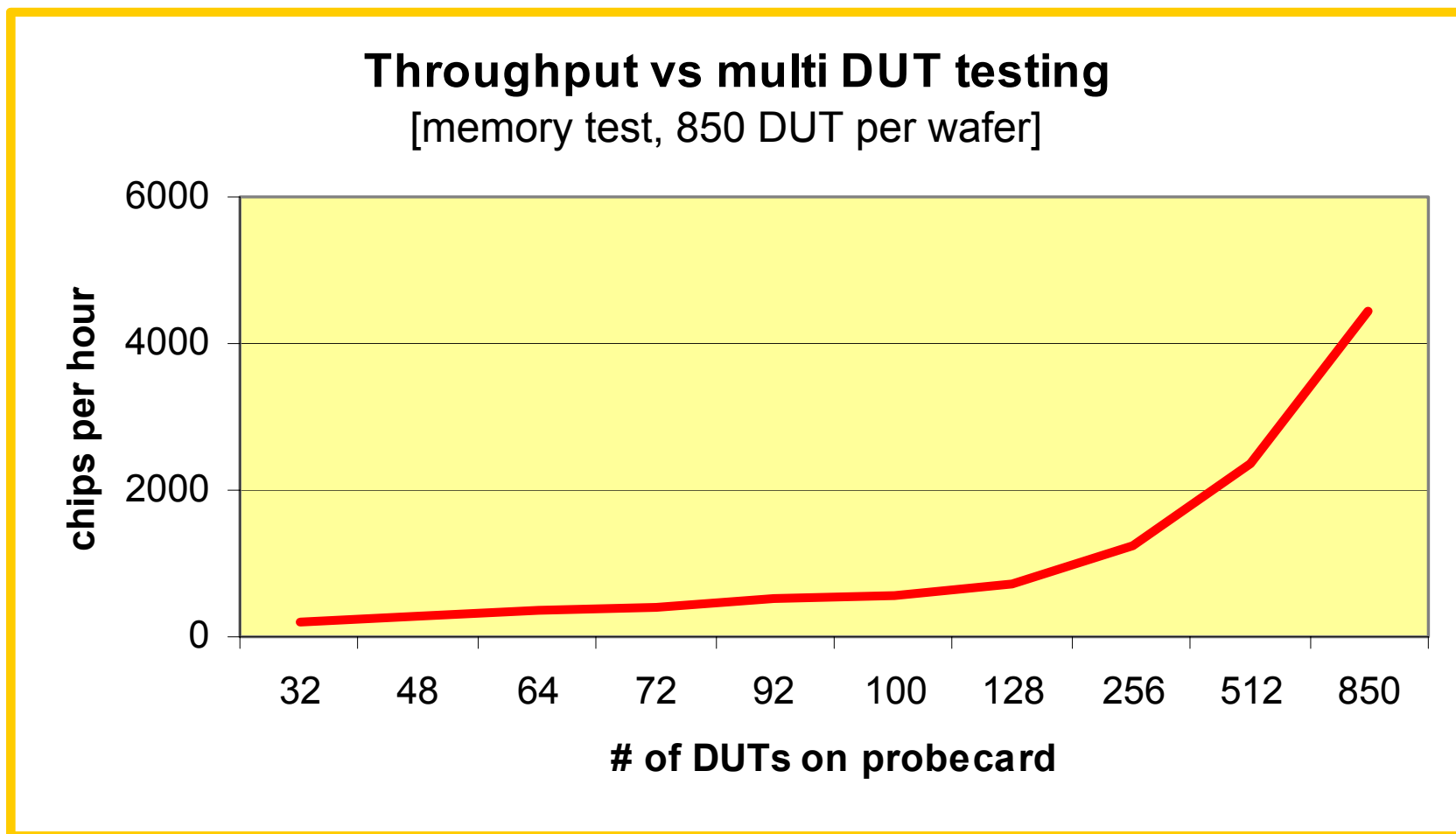


Memory 64 DUT
60 x 60 mm²/ high temp.
Contacts: 2500
full serial production

| application | pitch [μm] | active area [mm ²] |
|--------------------------------|----------------------------|-----------------------------------|
| smartcard μ -controller | 105; 95 | 17x17 32x32 |
| small memory 32 DUT | > 100 | 40x60 |
| large memory 64 DUT | > 100 | 60x80 |

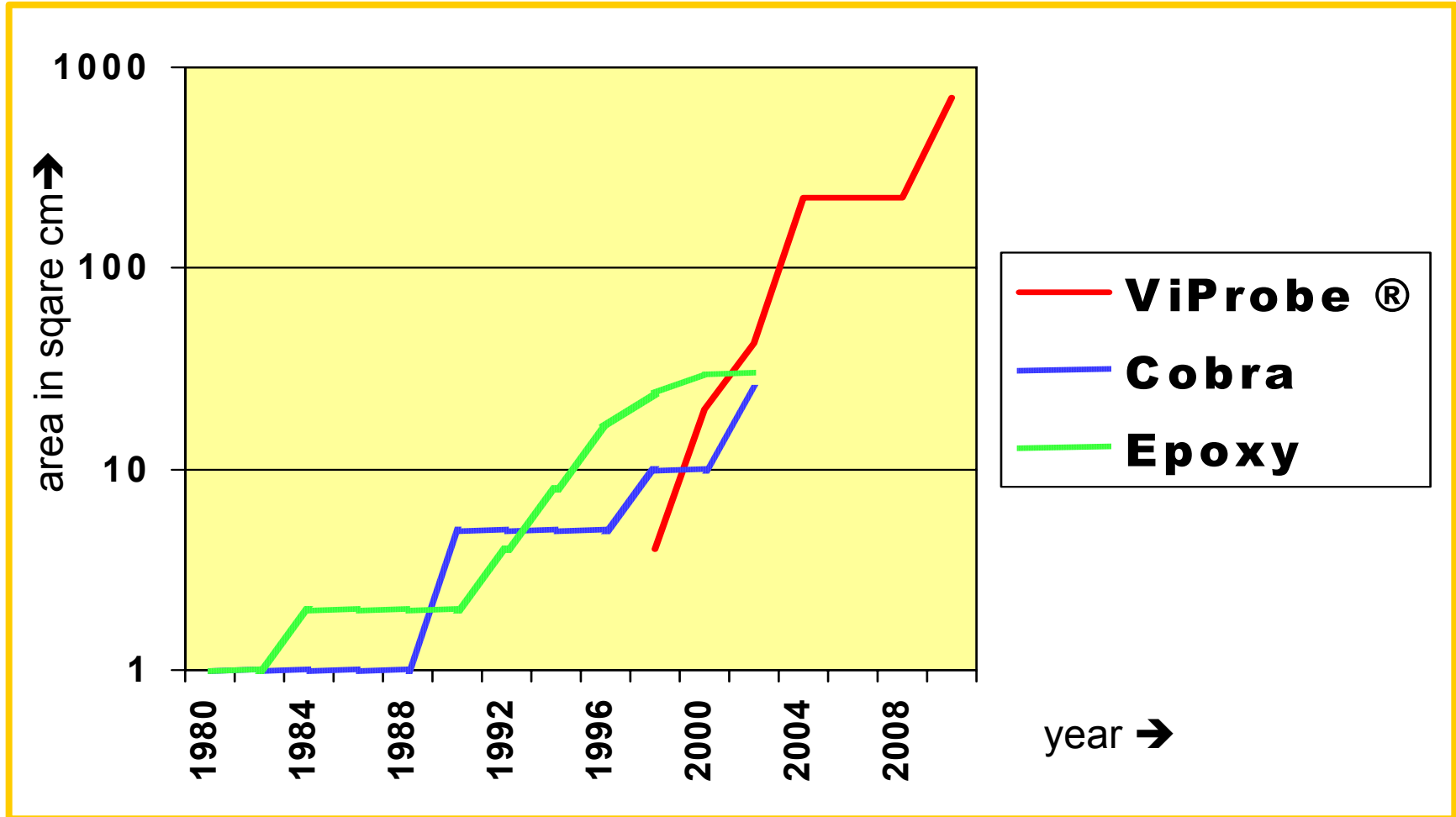
Overview:

Why *full wafer* test?

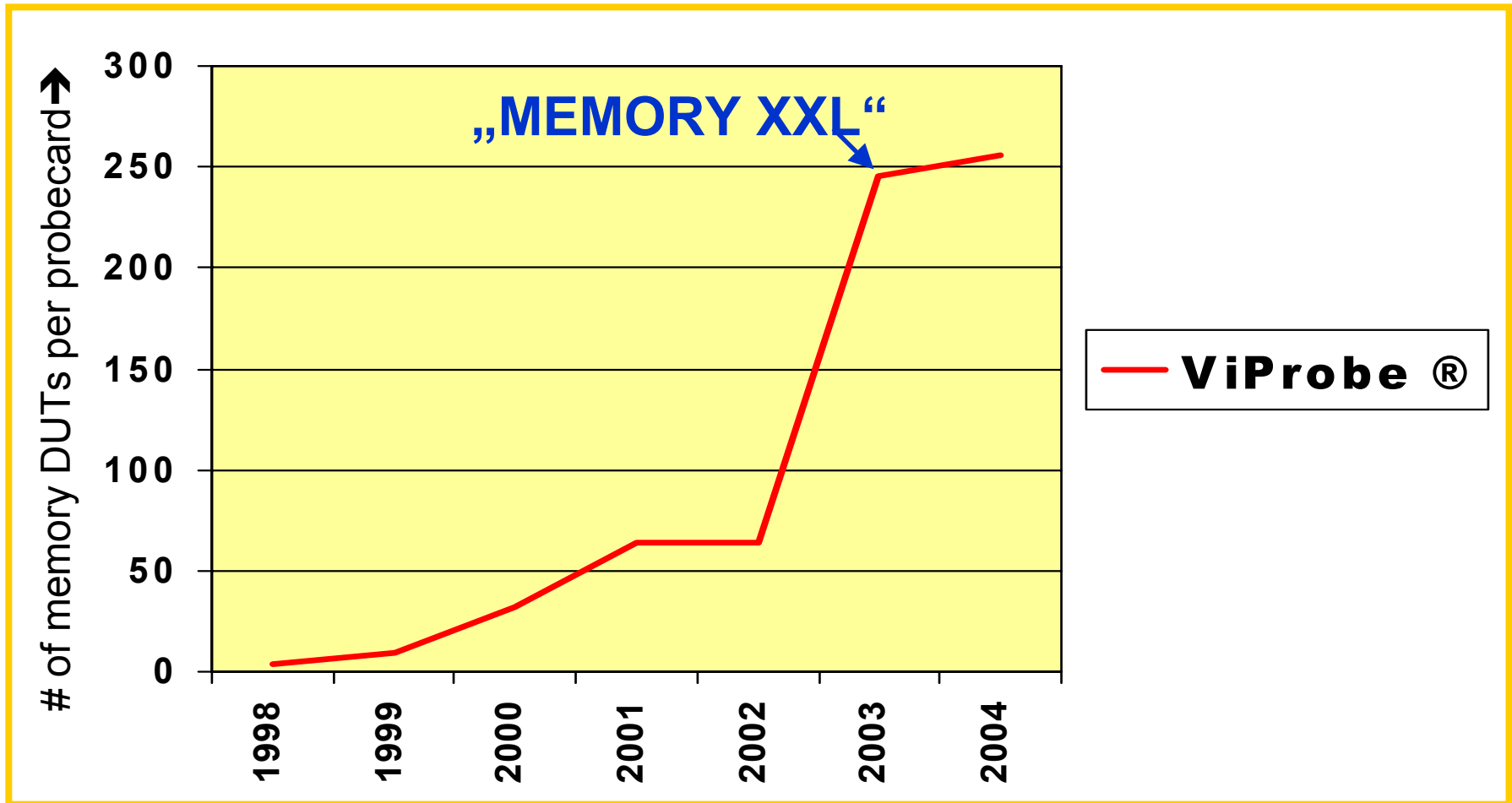


Overview:

Probing Area, vertikal



Overview: DUT development



Memory XXL: Challenges

64 DUT status

60x60 mm²

2200

300 mm

220N (22kg)

800 I/O; 64PS

no influence

2 h

testarea

pincount

probecard diameter

total probe force

PCB-routing

temperature

test time analyzer

256 DUT spec.

150x150 mm²

10.000

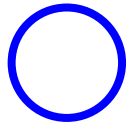
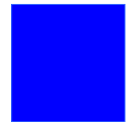
440 mm

700N (70kg)

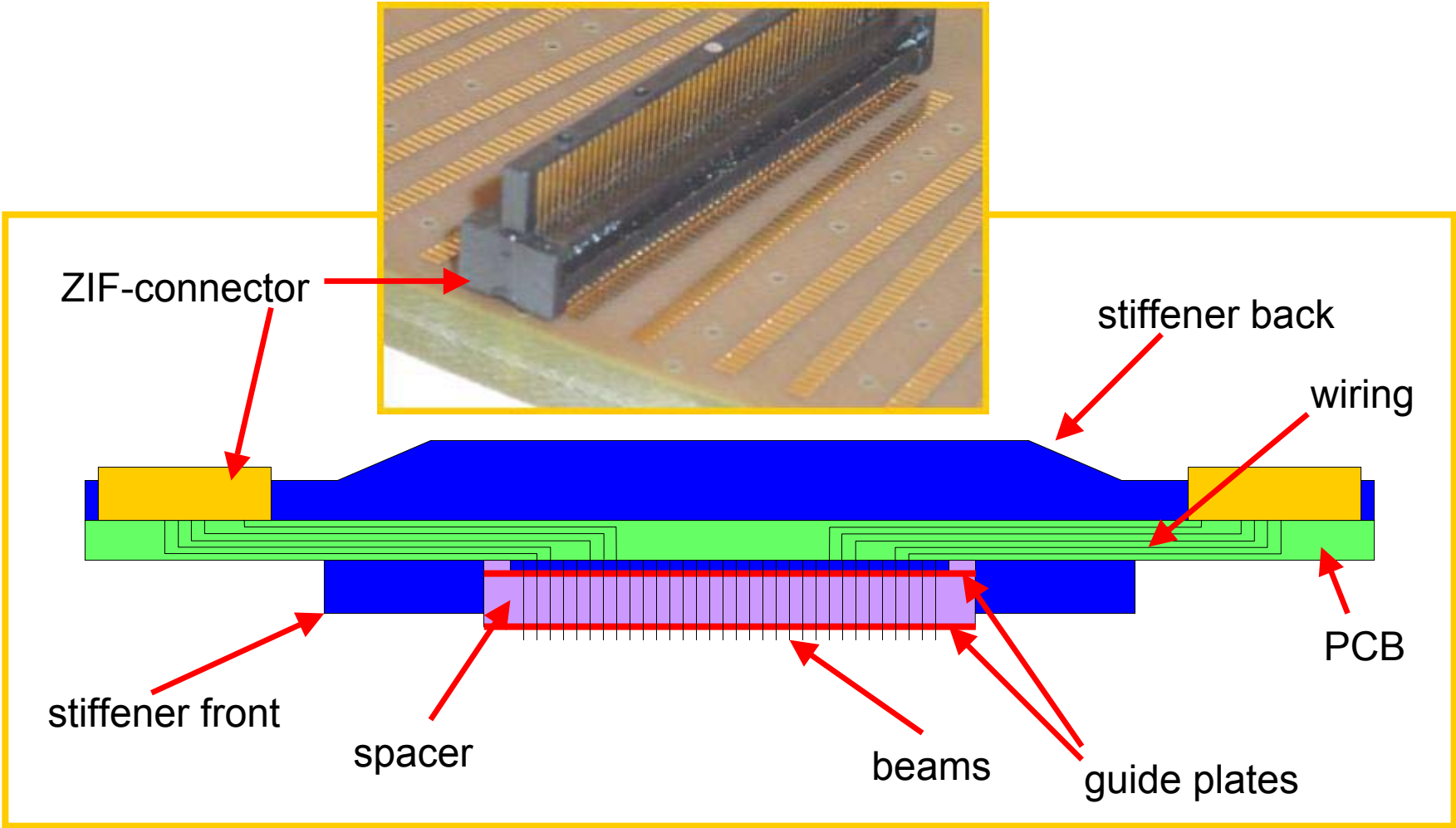
3300 I/O; 256PS

Z-change

>10 h



Memory XXL: General Design



Memory XXL: The Contact Head

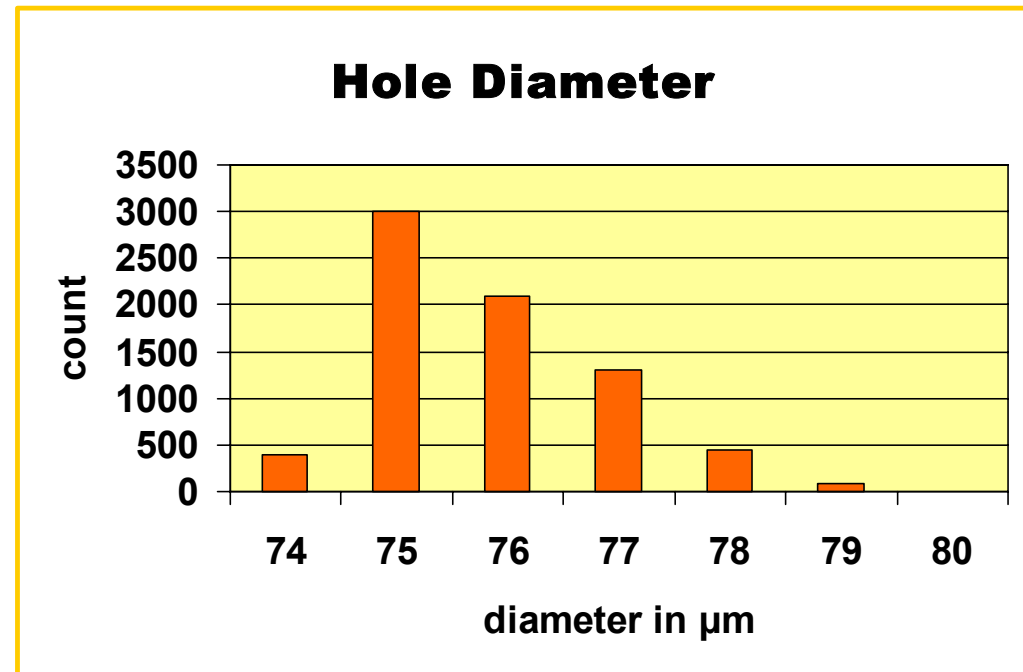


Memory XXL: Details Overview

- ◆ Guide Plates: How to manufacture such plates
- ◆ Probecard dimension: special production tools
- ◆ Force: special stiffener
- ◆ PCB design
- ◆ Temperature influence to planarity
- ◆ Test constrains

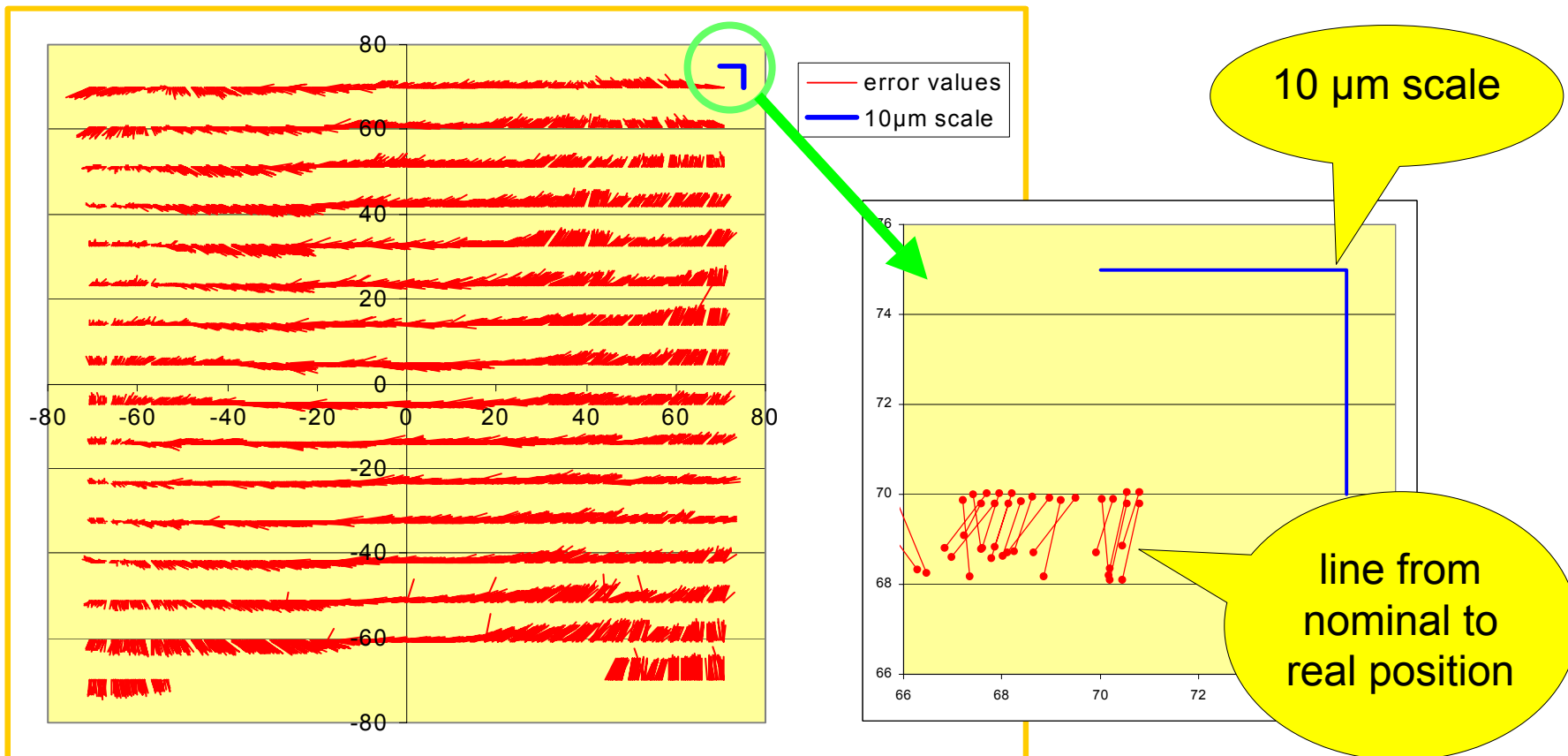
Memory XXL: Guide Plates 1

- ✦ Proprietary material with a CTE similar to silicon: less than $7\mu\text{m}$ position error with 150mm image at 90°C test temperature
- ✦ Drilling:
custom made
drilling machine
for high accuracy
holes



Memory XXL: Guide Plates 2

◆ Position accuracy on 150mm x 150mm

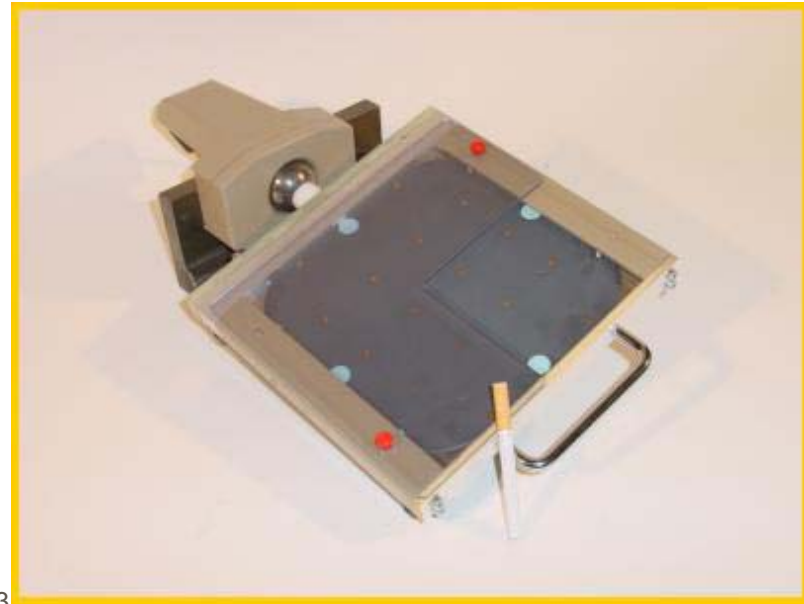


Memory XXL: Probecard Dimension

- ◆ Size: 440mm diameter
- ◆ Weight: 10 kg
- ◆ Cost: >> 100.000 US\$

Probecard handling during manufacturing must change!

- ◆ Dedicated handling utilities are necessary
 - no hand carry
 - special tools for all mounting steps
 - preventive actions do avoid damage



Memory XXL: Force

- ✦ 2.5mil reduced beam size: 700N force!
 - ➔ max. probecard deflection: 15 μ m
- ✦ total weight with steel stiffener: 22kg
 - ➔ weight limit: 10kg (due to prober)

A new type of stiffener has been developed:

- ➔ special lightweight material
- ➔ FEM analysis to optimize construction

Memory XXL: PCB-Design, Data

- ✦ very high routing density:
 - 3300 I/O
 - 1600 other resources (PS, ect.)
- ✦ a high end PC (2.4GHz, 1GB RAM) showed significantly too less performance
- ✦ low propagation delay tolerance (<100ps) is very difficult to archieve due to limited space
- ✦ all software for process data preparation, drilling measurement ect. did collapse

Memory XXL: PCB-Manufacturing

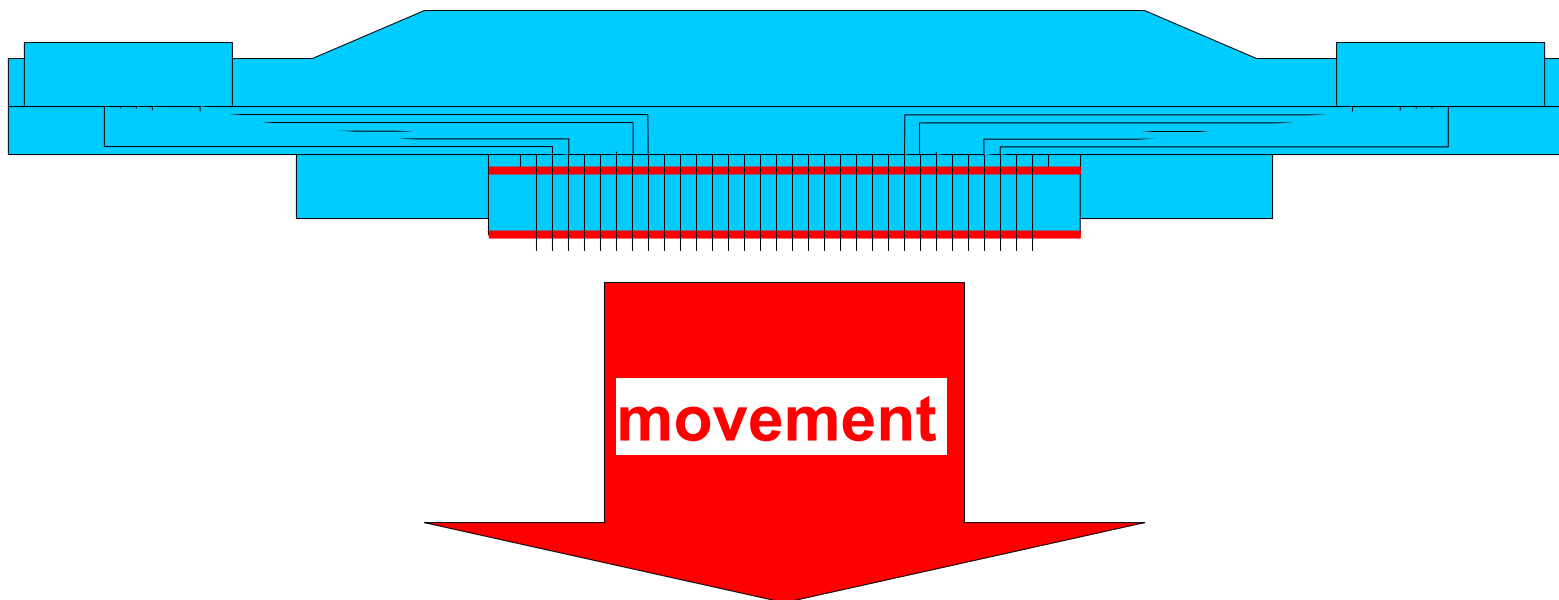
- ✦ very high planarity requirements:
 - special process for planarisation

- ✦ very high quality requirements
 - small throughholes
 - 90µm linewidth
 - laserdrilling

Memory XXL: Temperature 1

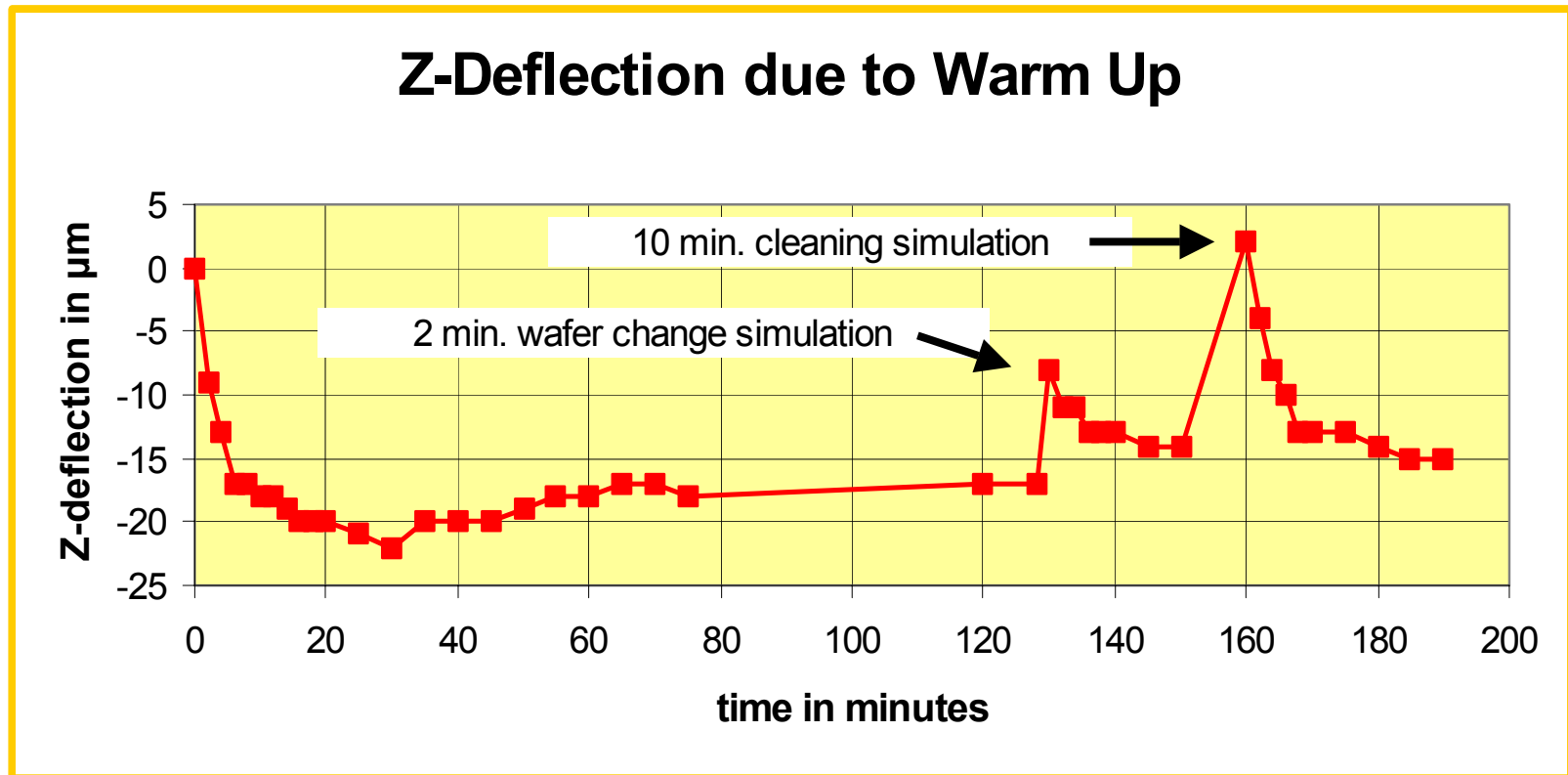
✦ Z-Deflection due to probecard warm up can be as high as **200µm**

➔ the beams would be destroyed just by the warm up



Memory XXL: Temperature 2

- ✦ An optimized construction keeps the Z-deflection error low



Memory XXL: Probecard Metrology

- ✦ FM's tester can not be used for testing:
 - 700N force needed; limit: 440N max.
 - 5000 channels needed; limit: 2250
 - available testarea 203mm x 114mm

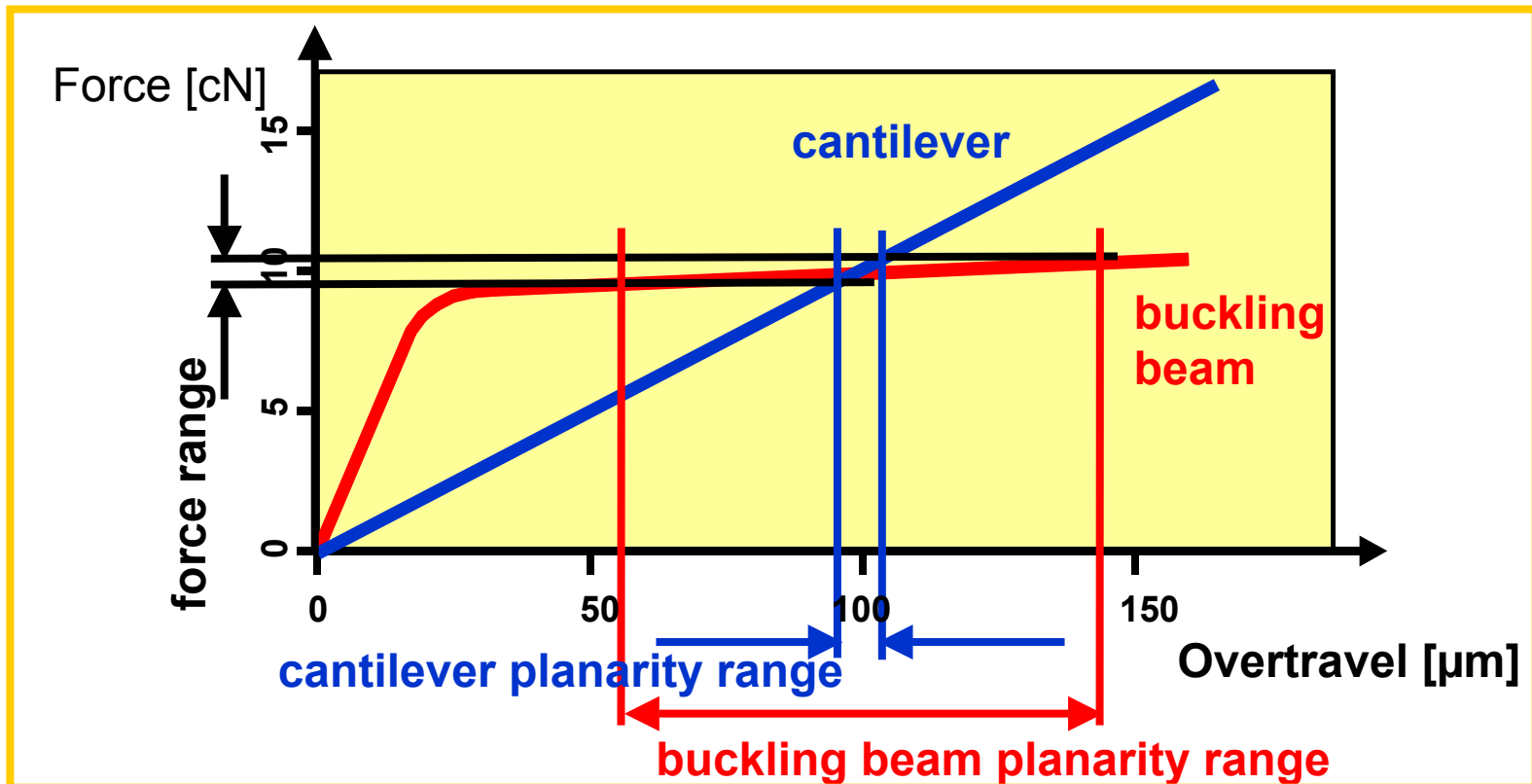
- ✦ an new prototype tester will be used:
 - 1000N force
 - 4500 channels
 - d=300mm testarea

Cost of Ownership: **Overview**

- ✦ CoO is determined by two major factors:
 - Robustness
 - Easy repairability

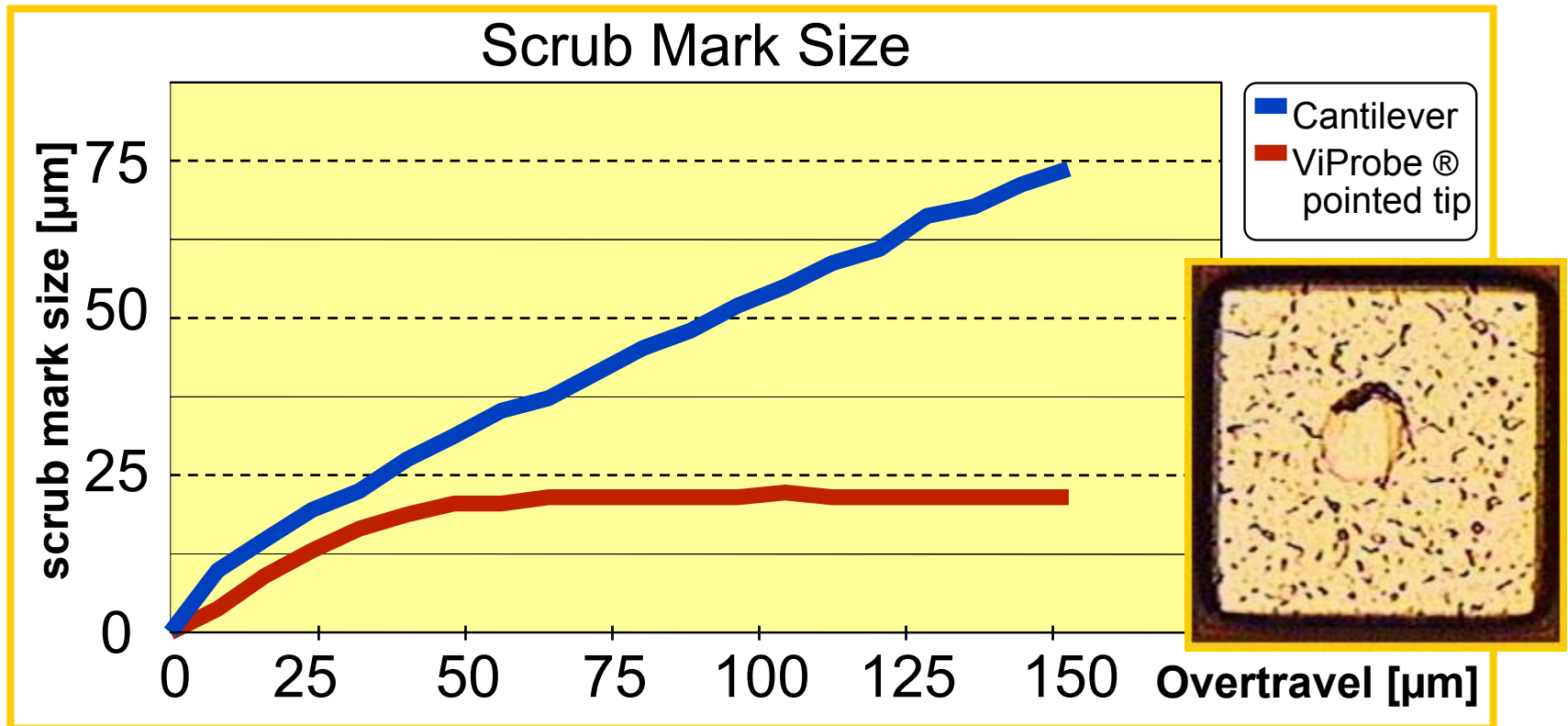
Cost of Ownership: **Robust Planarity**

- ✦ high possible overtravel allows a robust process



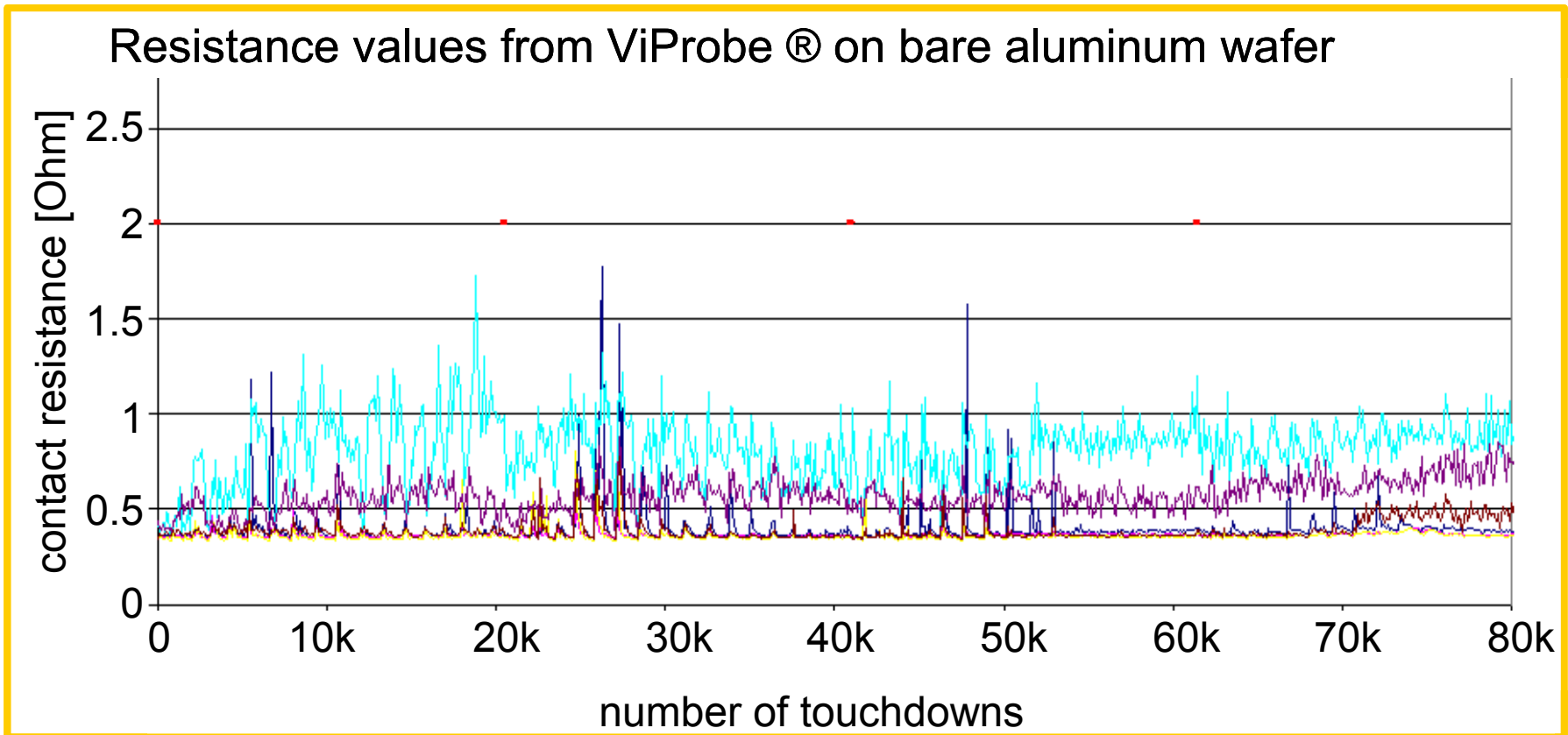
Cost of Ownership: Scrub Size

✦ very consistent, small scrub marks can be reached



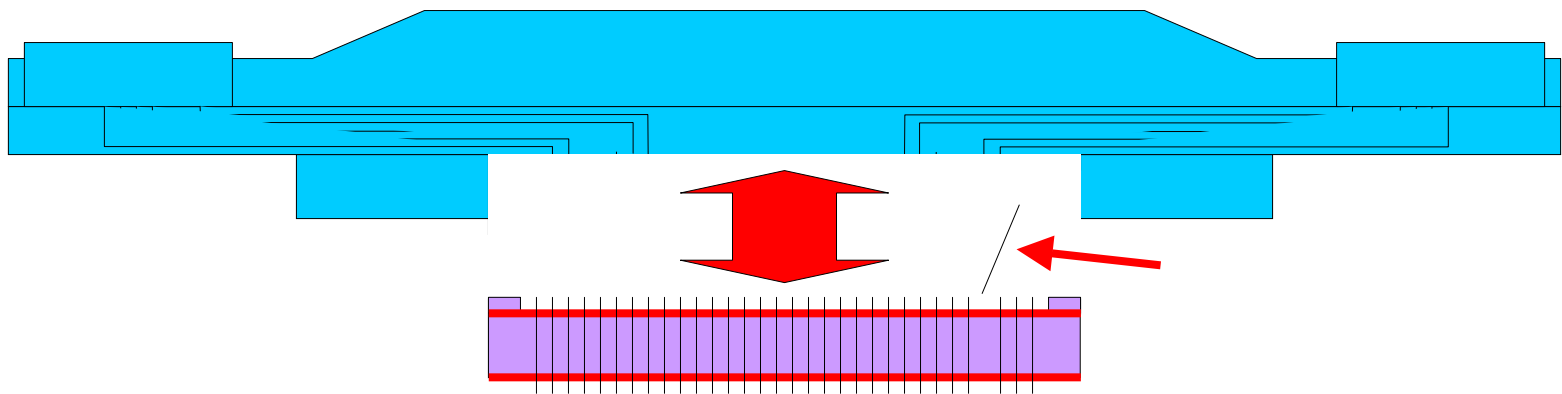
Cost of Ownership: Resistance

✦ a constantly low contact resistance is the result



Cost of Ownership: **Maintenance**

- ✦ single beams can be exchanged
- ✦ the whole probehead can be exchanged by the customer



The way to full wafer test

- ✦ No. of probes per DUT:
total number below tester limit
- ✦ Area enlargement for drill process
- ✦ weight limit: >25kg (probecard handling
at manufacturer and user!)
- ✦ PCB: planarity improvement
- ✦ PCB-design: more computing power

Thanks for listening



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