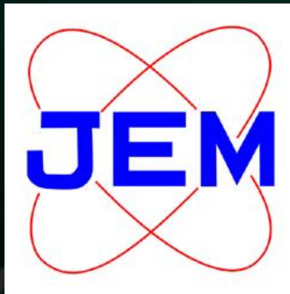
3D-MEMS Probe for Fine Pitch Probing



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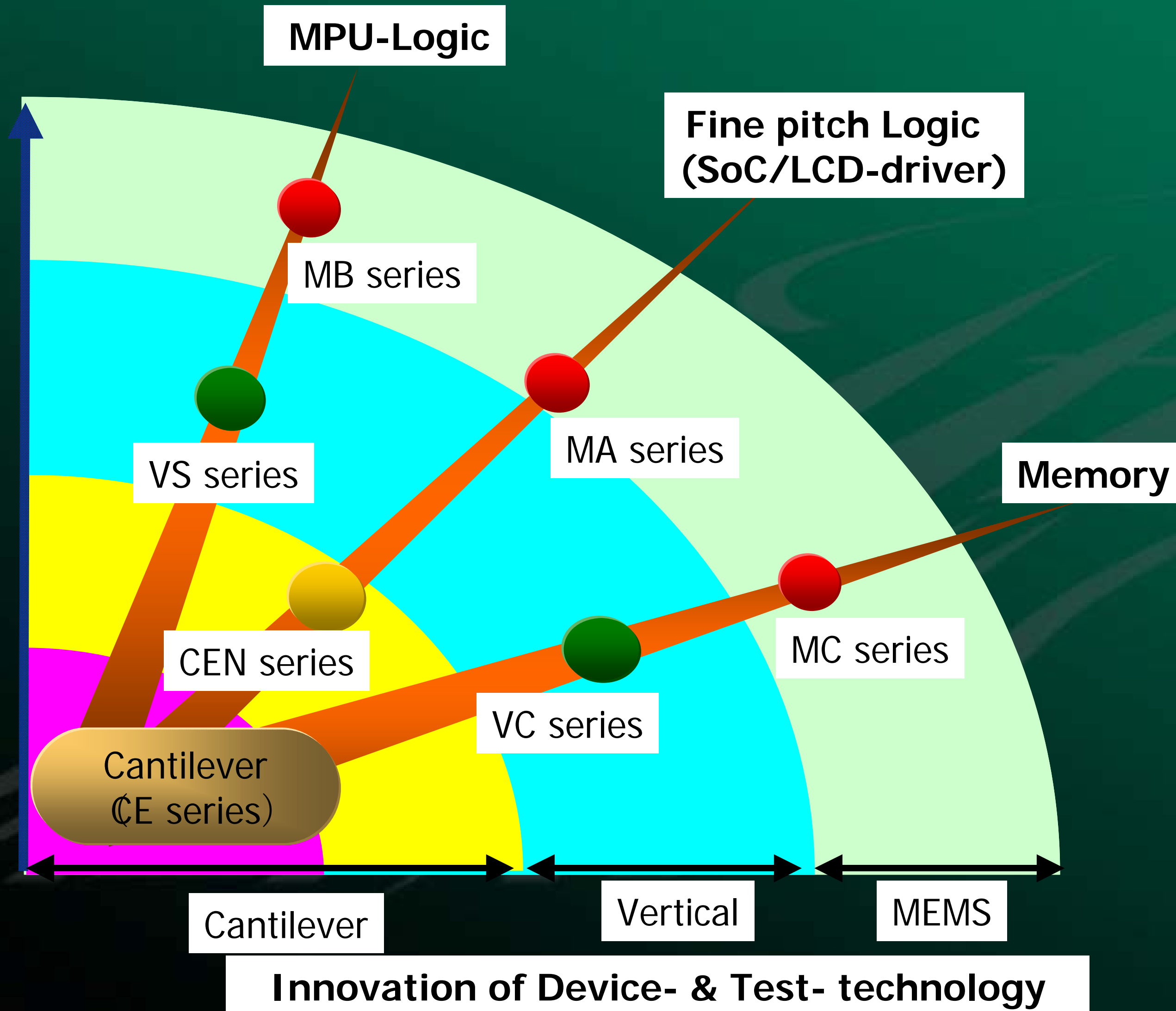
Presentation Overview

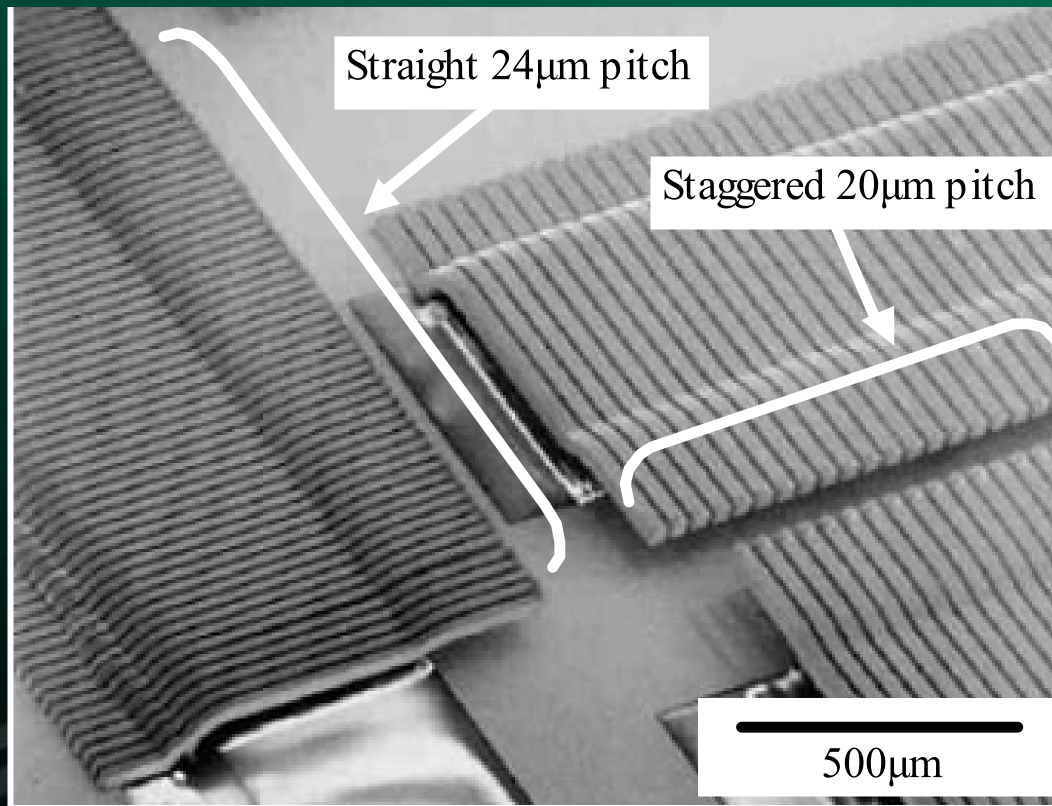
1. Introduction
   - JEM product overview
2. Objectives
   - Challenges in fine pitch probing
   - Development of 3D-MEMS probe
3. Evaluation
   - Individual fine pitch cantilever
   - Actual probe layout
4. Conclusions
5. Next steps

1. Introduction

JEM Product Overview



Application of 3D-MEMS probe (MA)



LCD-driver

2. Objectives

Challenges in Fine Pitch Probing

- LCD-driver
  - Pad pitch shrink
    - 20 μ m staggered, 24 μ m inline
  - Stable contact with low force
  - Avoid gold bump damage
  - Multi dut probing

Challenges in Fine Pitch Probing

- SoC
  - Pad pitch shrink
    - 30 μ m pitch
  - Stable contact with low force
  - Avoid pad damage
    - Low - k
    - CUP（Circuit Under Pad)
  - Multi dut Probing

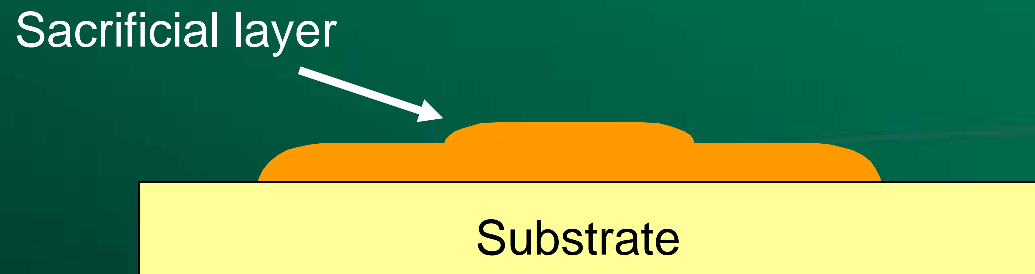
Development of 3D-MEMS Probe

- Develop fine pitch cantilever with mechanical endurance
- Achieve lower contact force with good contact resistance
- Achieve precise xyz alignment in actual probe layout

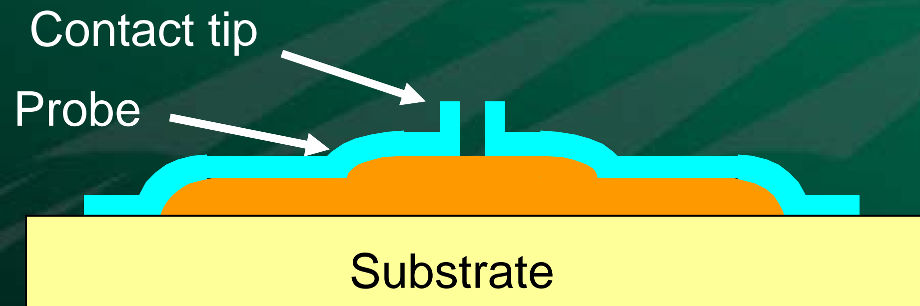
3. Evaluation

3D-MEMS Probe Process

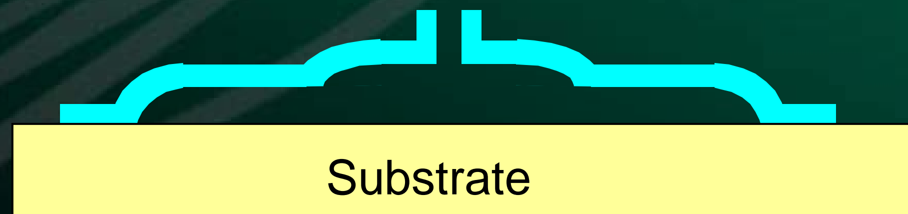
Sacrificial layer on substrate



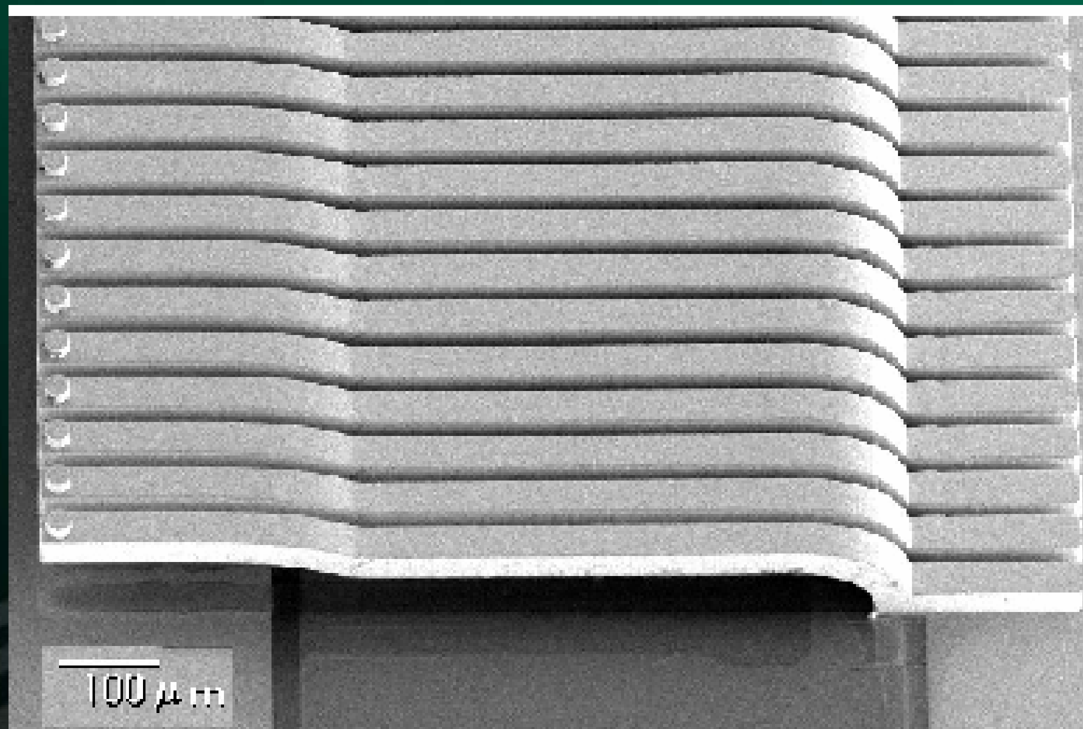
Probe on sacrificial layer



Remove sacrificial layer



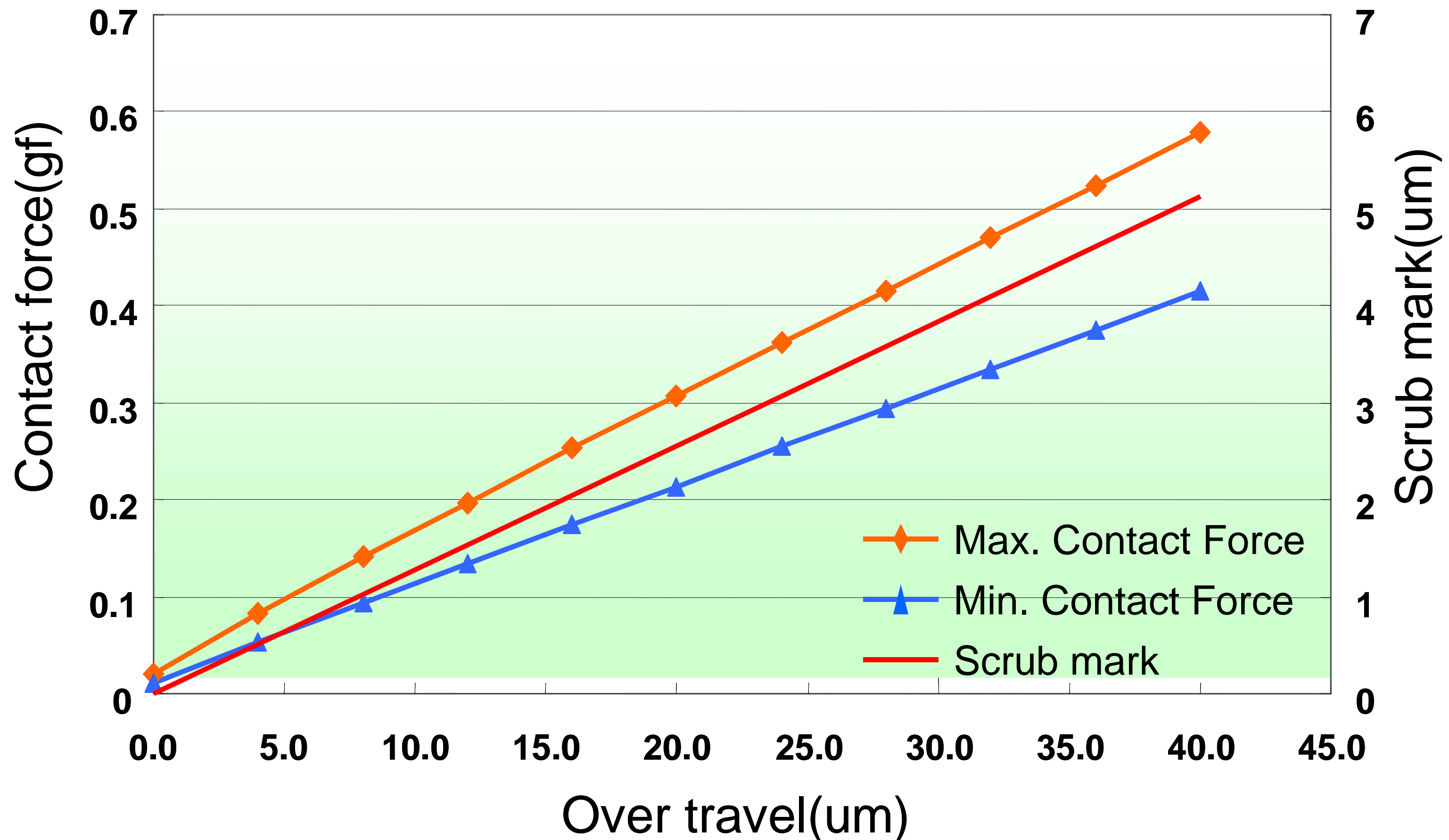
SEM Image of Fine Pitch Cantilever



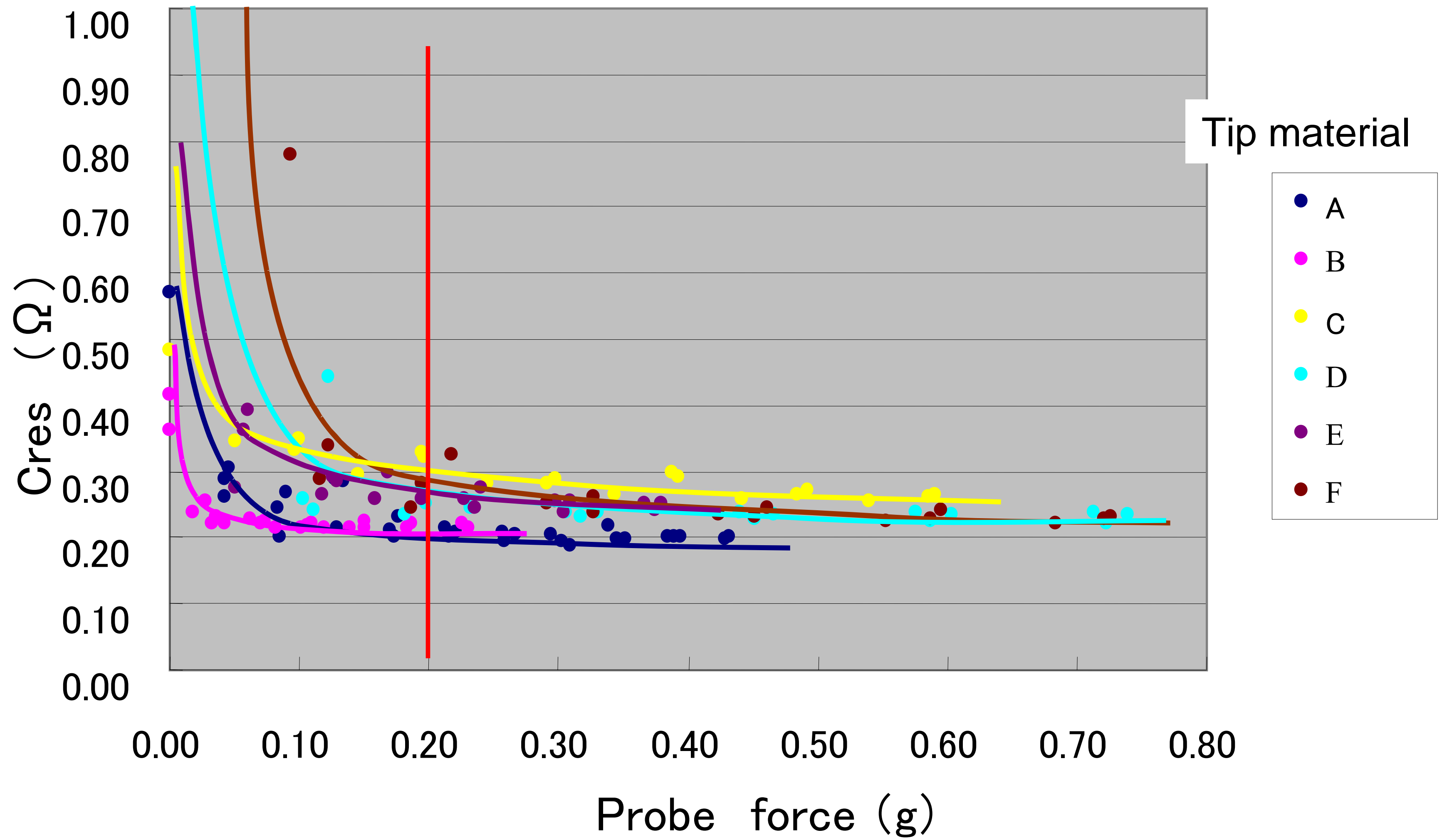
Evaluation Items

- Individual fine pitch cantilever
  - Contact force/Scrub mark/OT
  - Contact resistance
  - Contact tip wear
- Actual probe layout
  - XY alignment
  - Planarity
  - Actual device

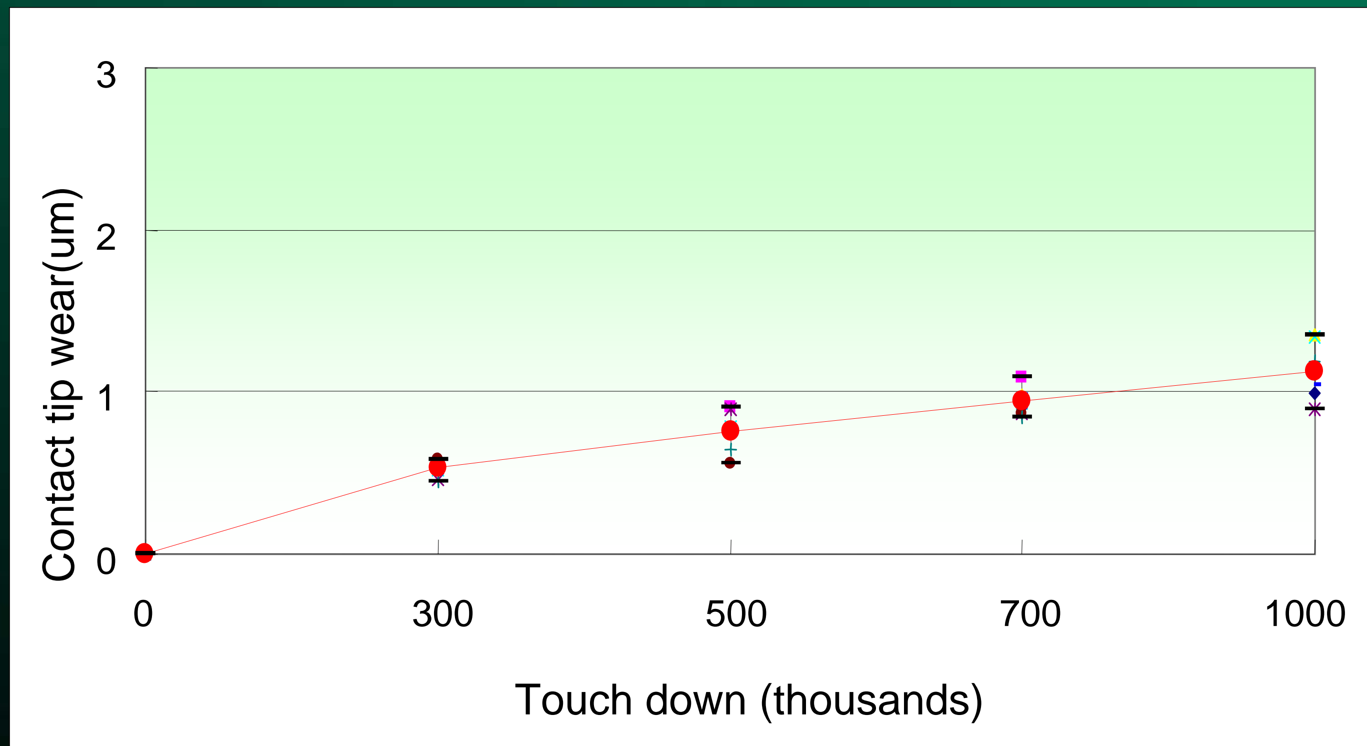
Contact Force / Scrub Mark / OT



Contact Resistance（Au Plated Wafer）



Contact Tip Wear



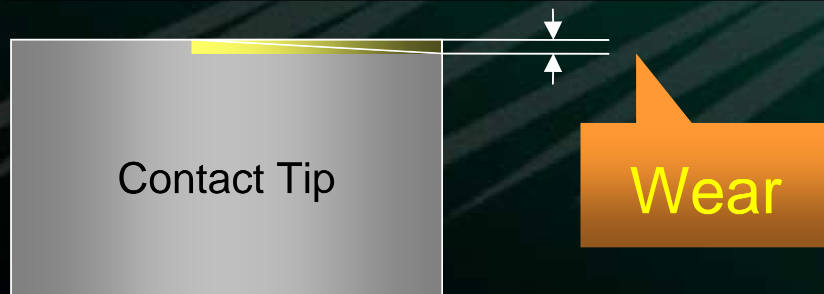
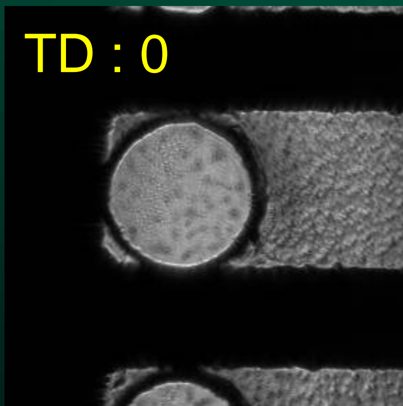
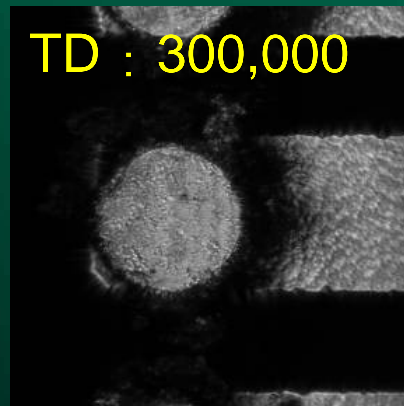
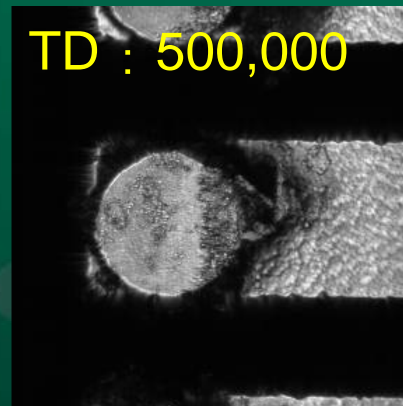
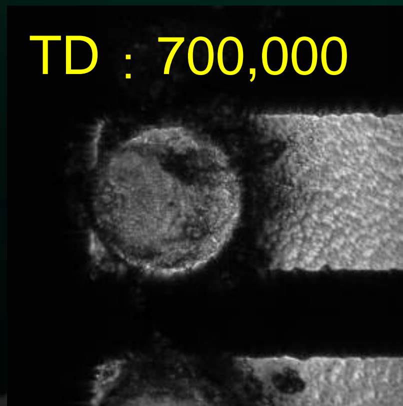


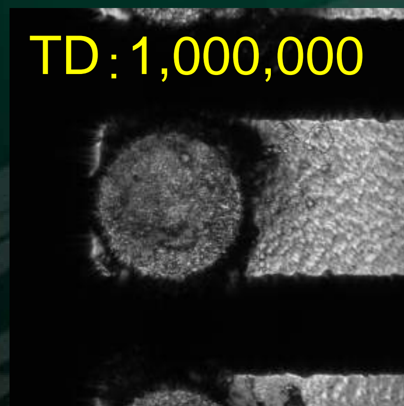
Image of Contact Tip Wear





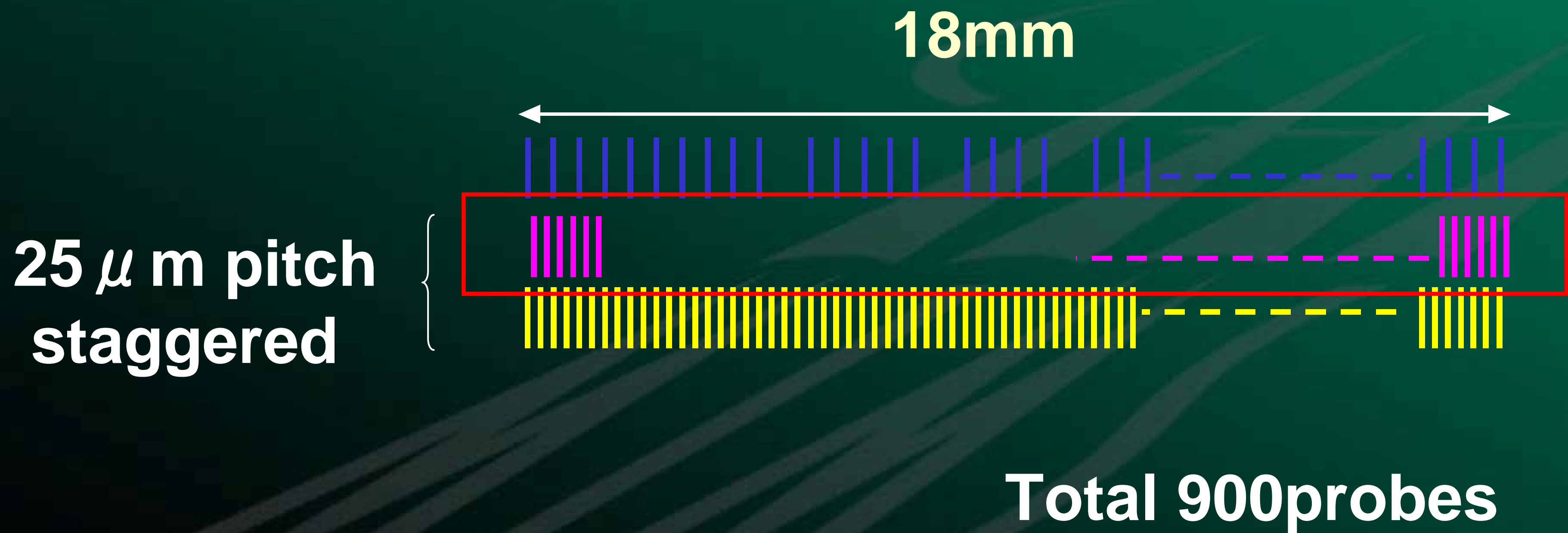






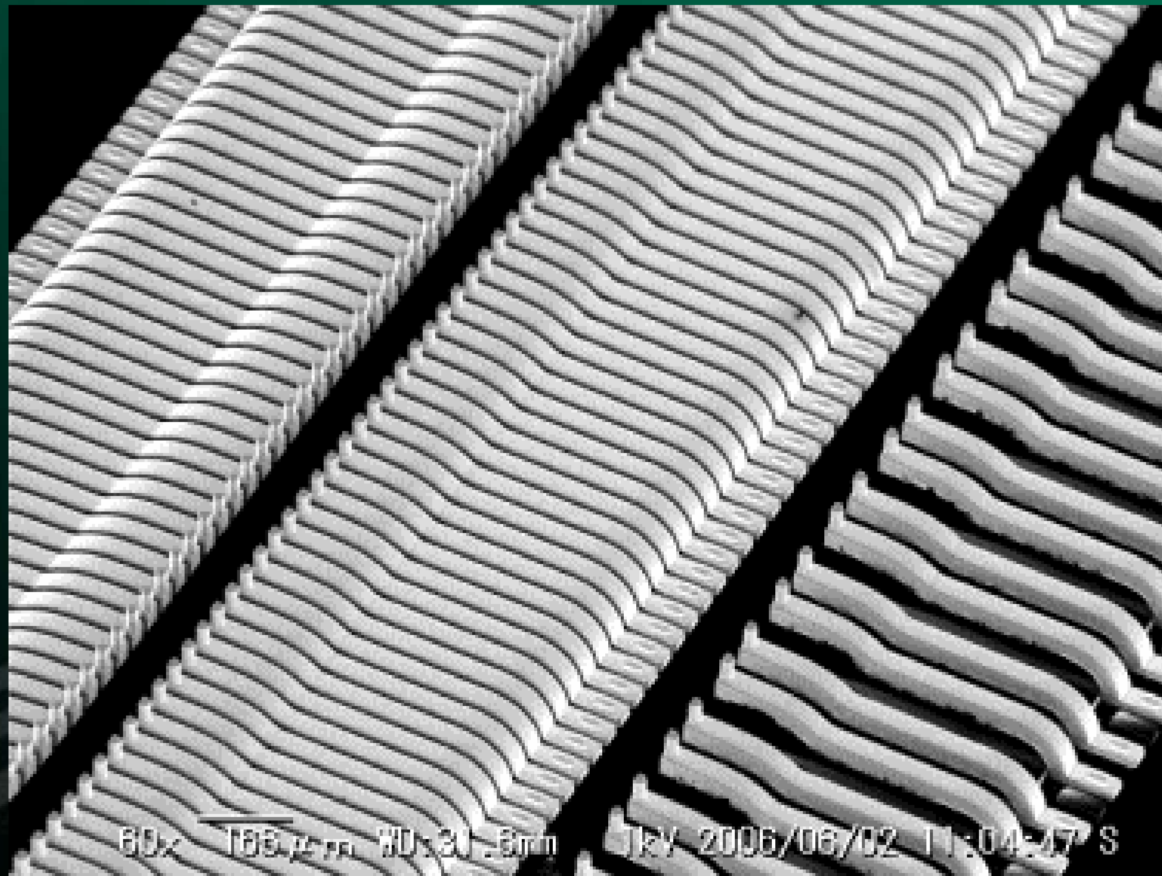
No significant change was observed after 1M touchdowns (no cleaning)

Actual Probe Layout

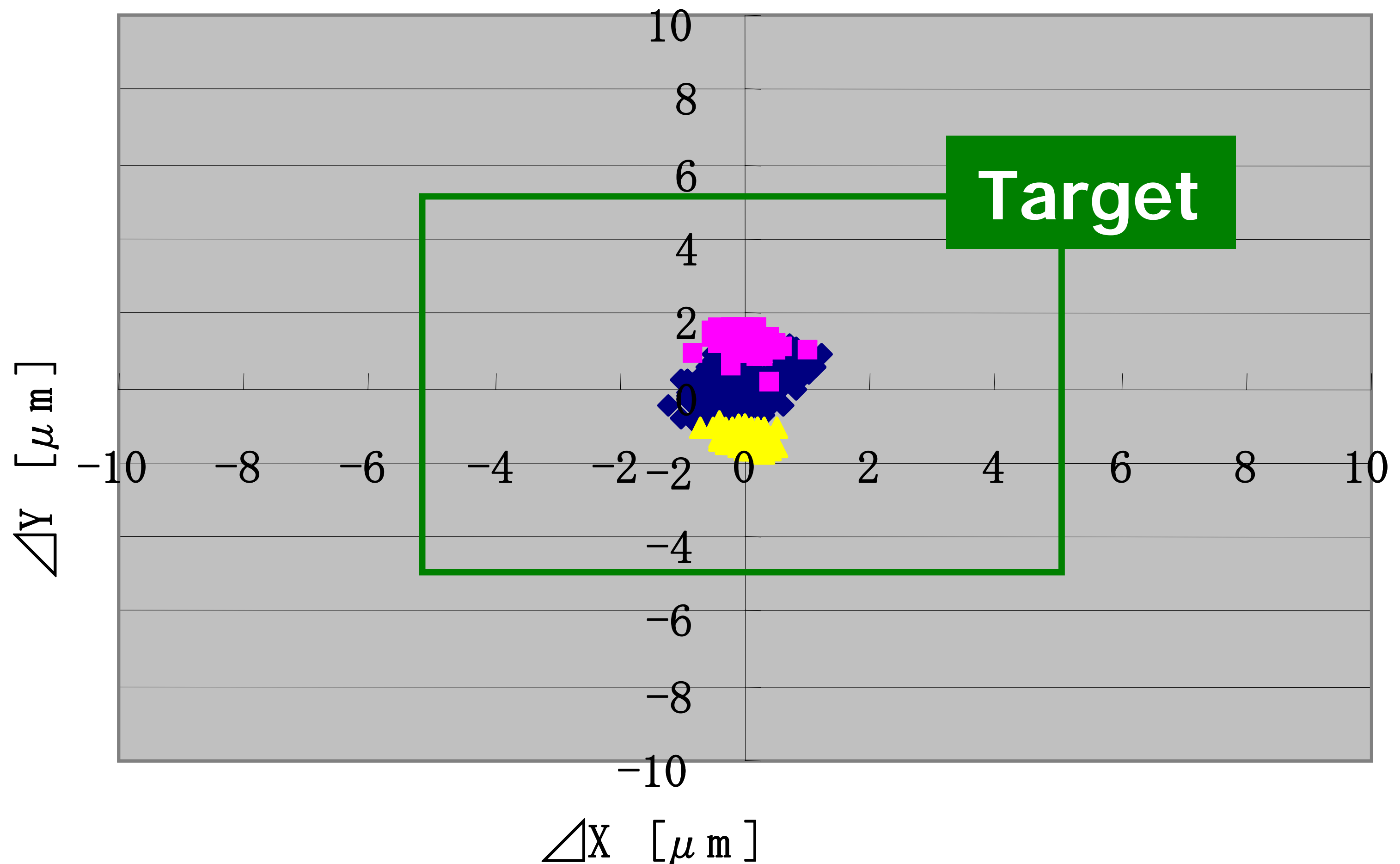


Total 900probes

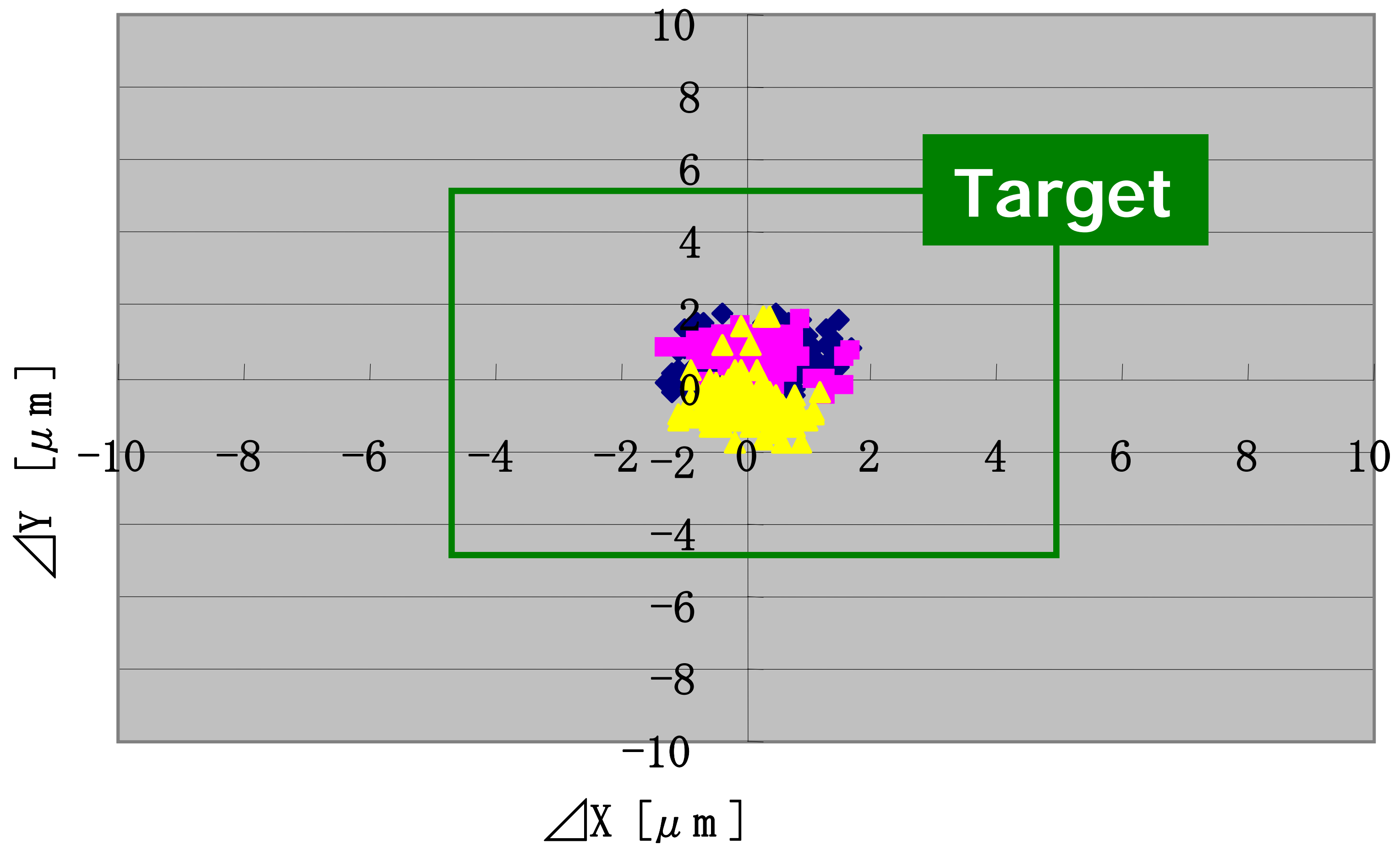
SEM Image of Probes



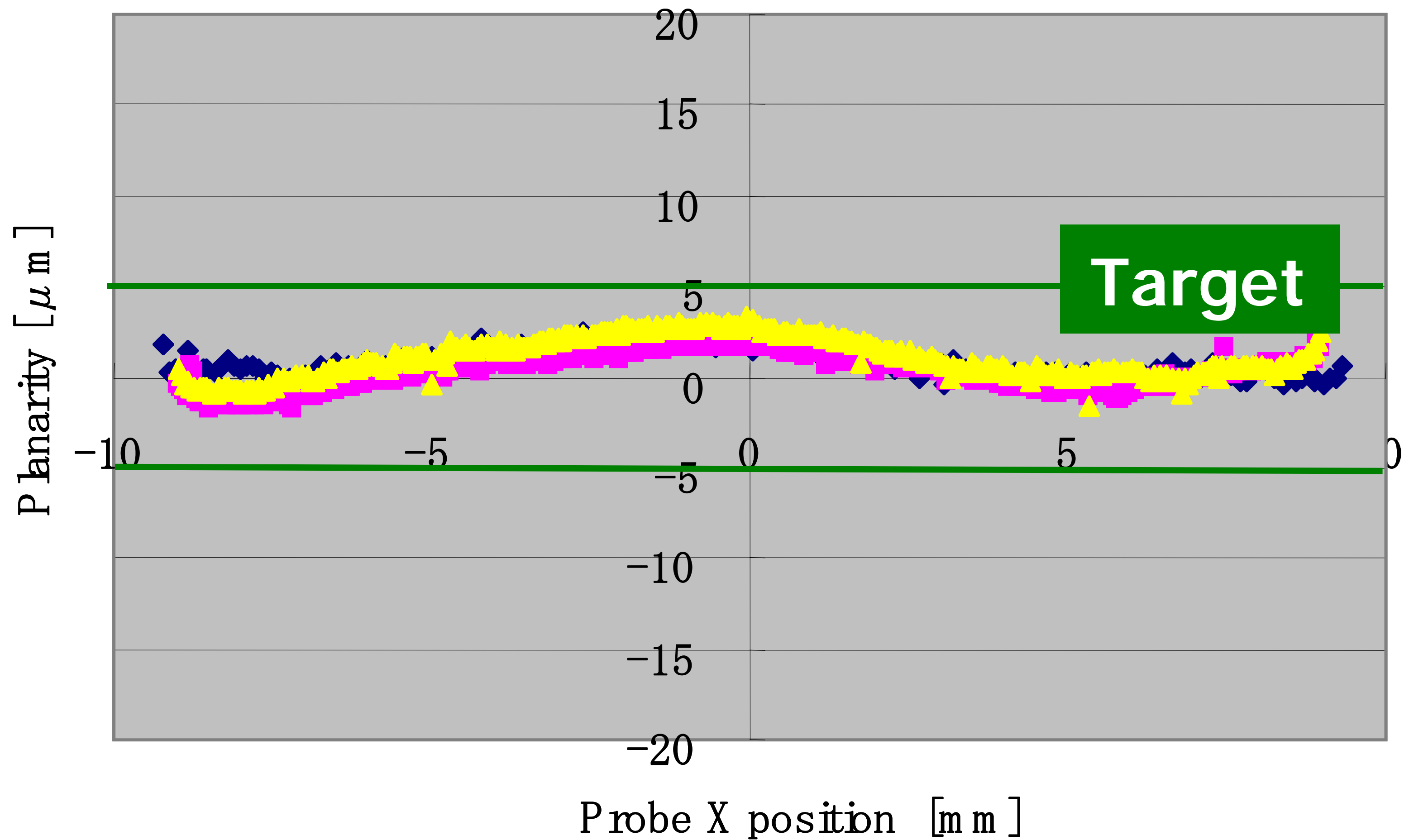
XY Alignment (Initial)



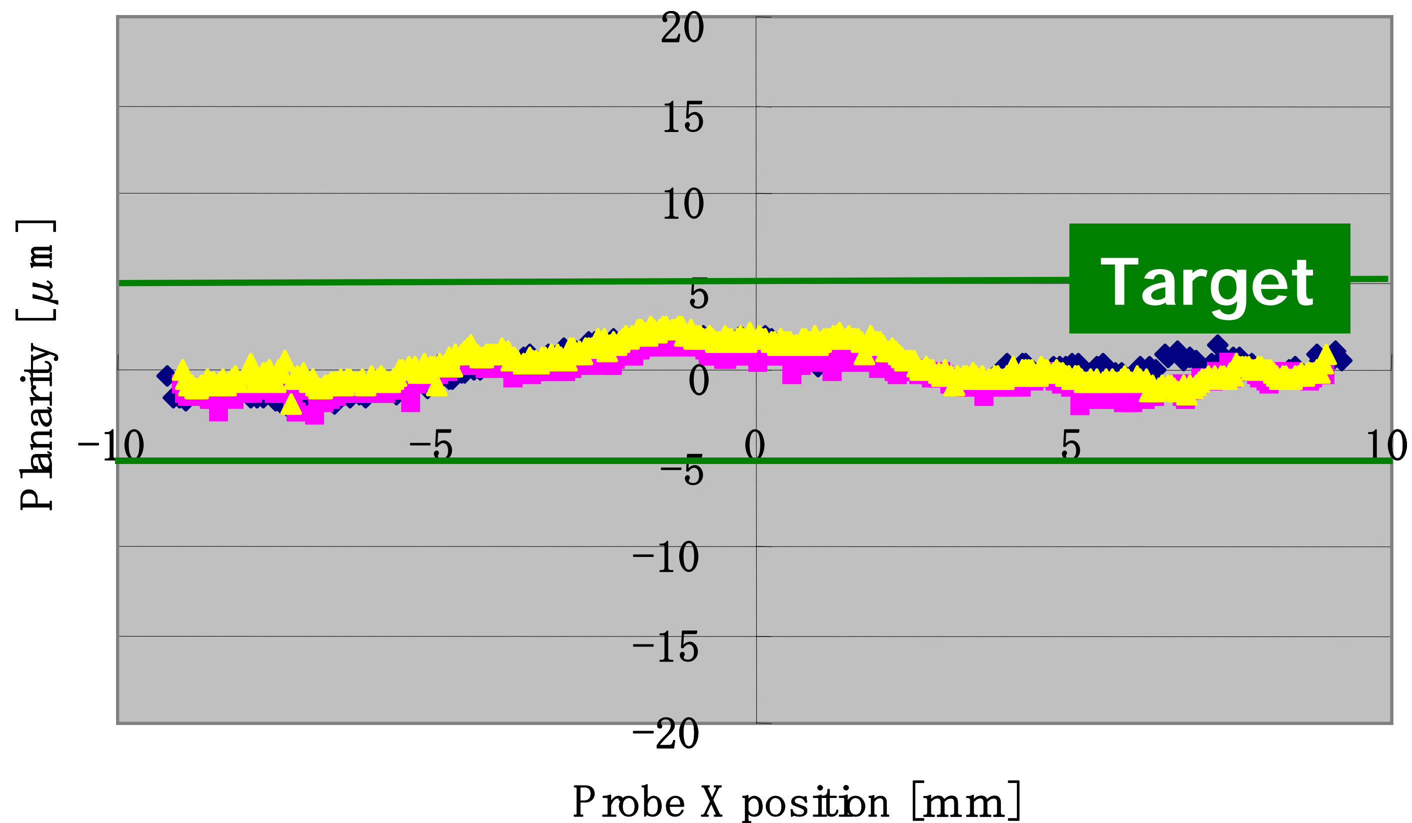
XY Alignment (after 1M TD)



Planarity (Initial)



Planarity (After 1M TD)



Evaluation on Actual Device

- Prober setup was done very well.
  - Alignment
  - Tip recognition
  - Planarity
  - Contact

- Electrical function test was completed.

4. Conclusions

Conclusions

1. Fine pitch cantilever (MA) has been developed by using the 3D-MEMS probe technology.
2. Excellent contact with low force (0.2gf) against Au plated wafer.
3. Mechanical stability over 1M touchdowns has been achieved.
4. Evaluation on the actual device has been demonstrated.

5. Next Steps

Next Steps

1. Proceed the MA card into a volume production
2. Apply for SoC devices

   Optimize probe design, probe force, probe material, probe layout
3. Improve the assembly technology for multi-DUT probing
4. Next target for LCD-driver

   15 μ m staggered, 20 μ m inline

Thank You.