



SW Test Workshop
Semiconductor Wafer Test Workshop

Advanced cantilever probes showing
similar advantages as their vertical
opponent



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SW Test Podium Presentation Flow

- Drive / Motivation
- Key Parameters
- Setup
- First results
- Long term study
- Summary / Conclusion
- Acknowledgement

Drive / Motivation

- Low Pin count products (<100 pins)
- Old testers (>20 years) using 2" probe card
- Low performance of available Cantilever technologies (lifetime, contact stability, probe mark size, Al swarf/stringers, ...)
- High manual effort (maintain, set up, interruptions)
- Other available technologies not suiting
- Standardization

Key parameters of the probes

Standard Cantilever

- ~15 mil length
- Flat tip
➔ Large scrub mark
- 1.9 g per mil OT
- Tungsten (+ Rhenium)

JEM XP5

- ~25 mil length
- Round tip shape
➔ small scrub mark
- 1.1 g at max. OT (90um)
- Material 'XP5'

Technoprobe Canti3

- ~25 mil length
- Round tip shape
➔ small scrub mark
- 0.9g at max. OT (80um)
- Material LCR2 (same as vertical)

Setup up

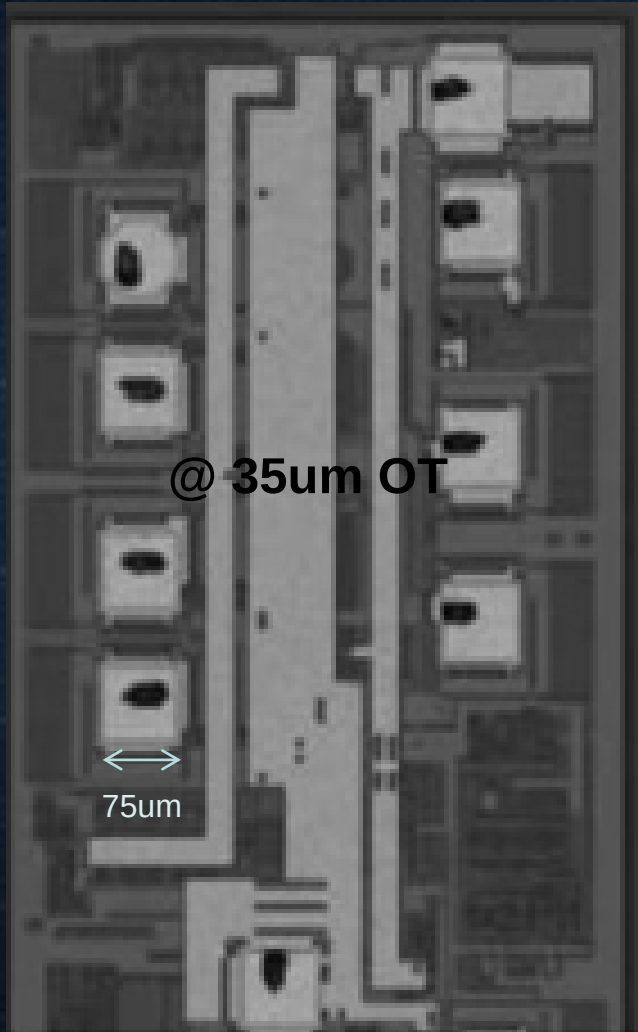
- **Prober: TSK UF200**
 - Standard 50mm cleaning block
- **Online Cleaning**
 - MIPOX WA6000 SWE
(if you want your needle tips behave like a vertical, treat it like one)
- **Test**
 - Currents up to 200mA per pin

First results

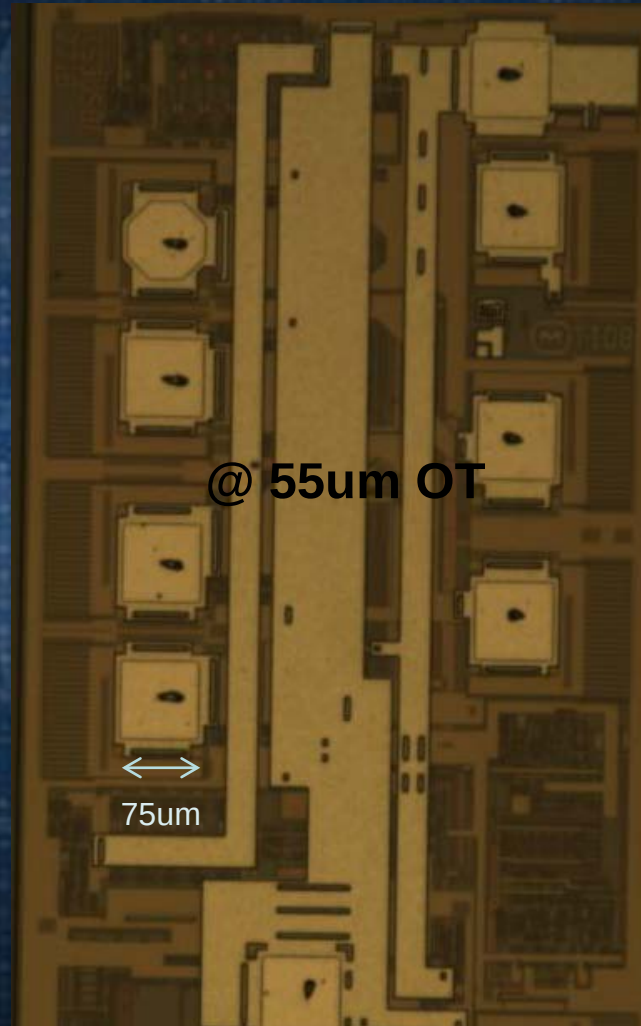
- Corresponding probe marks
- Cracks below bond pad
- Needle shapes
- Electrical Contact
- Probe yield comparison

Corresponding Probe Marks

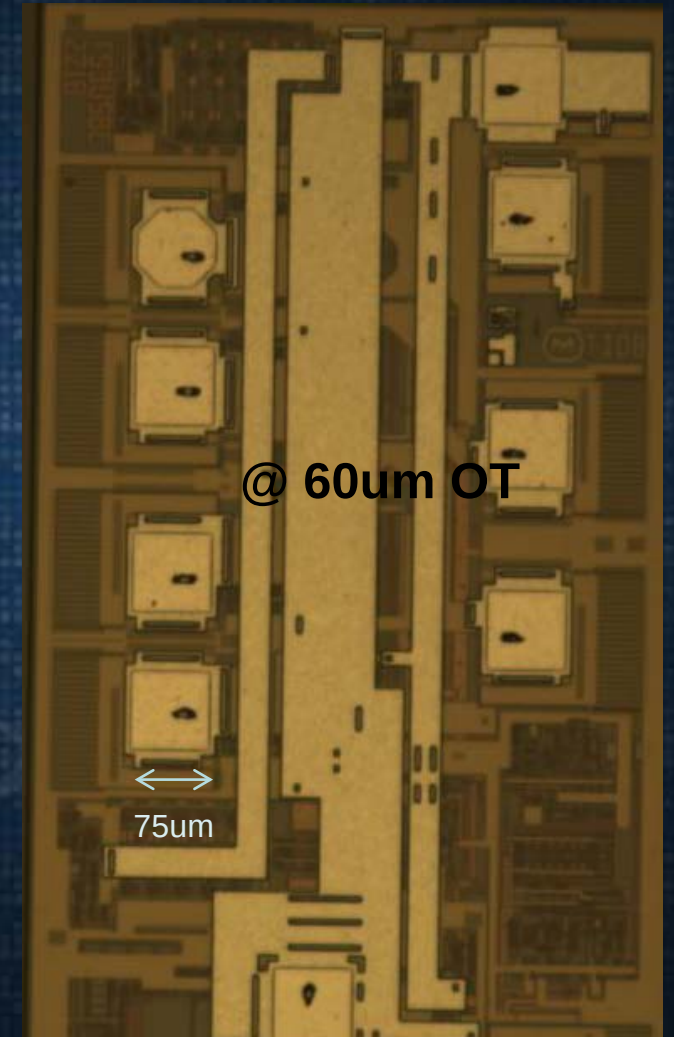
Std. Canti.



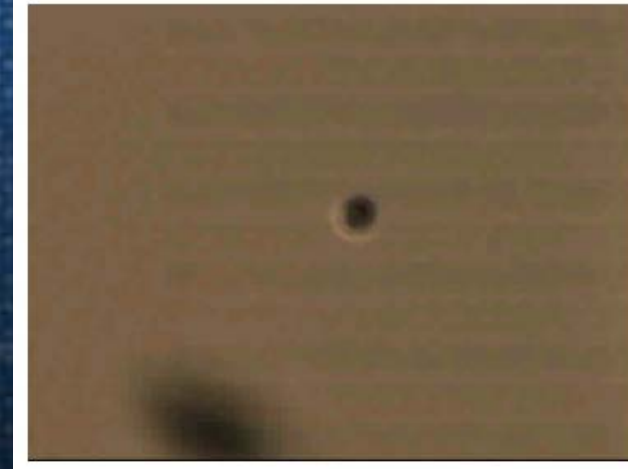
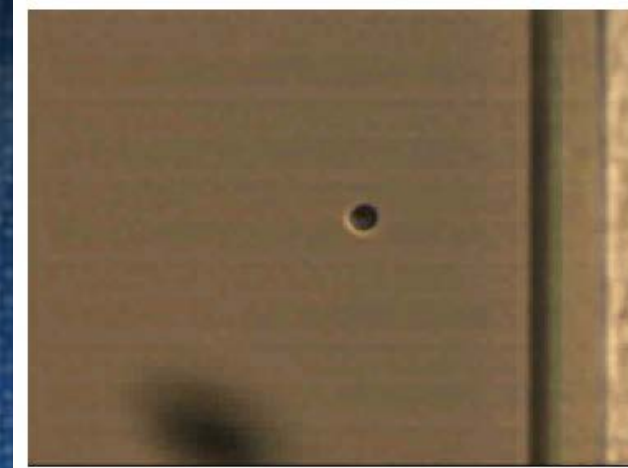
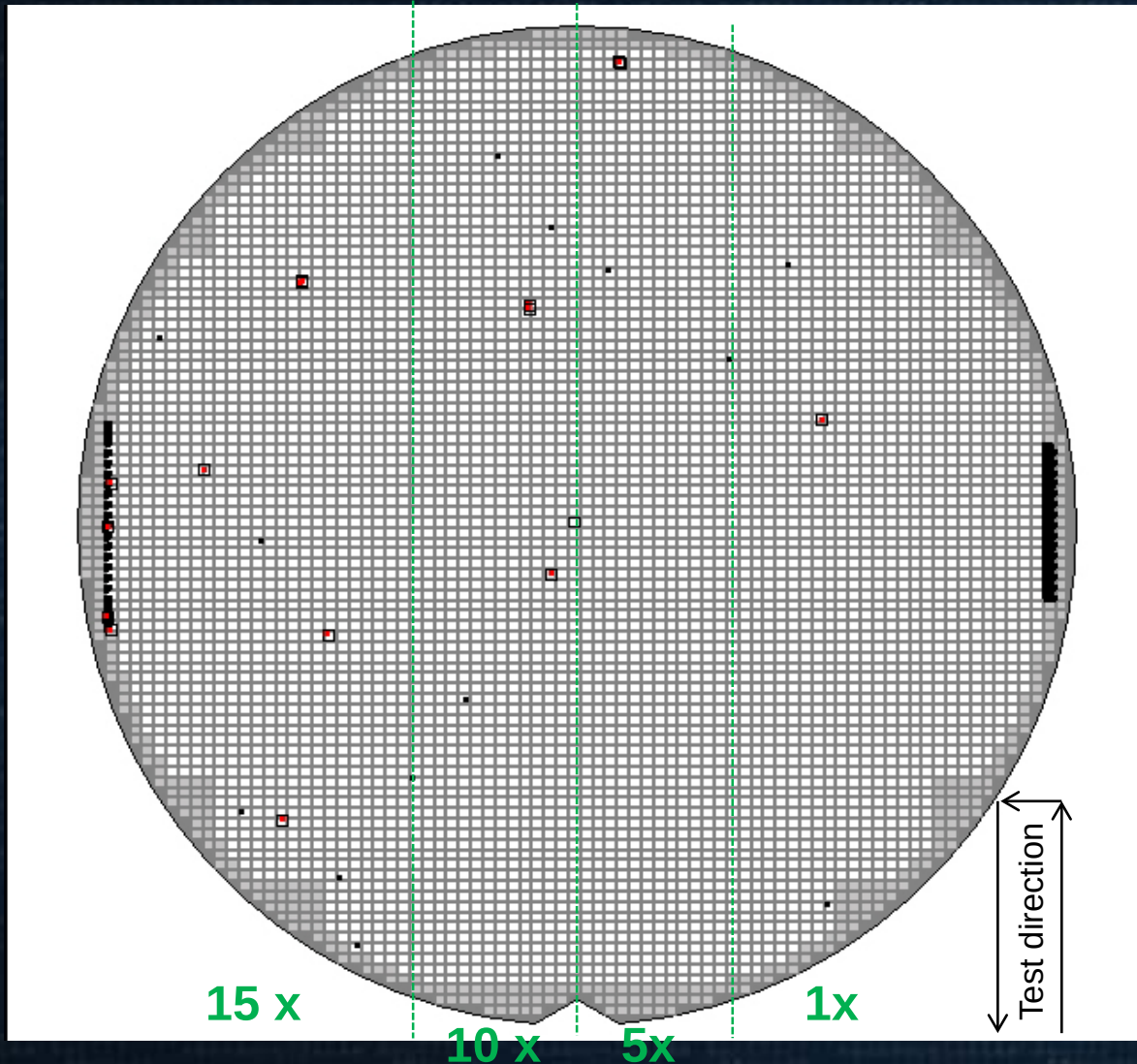
Canti 3



XP5



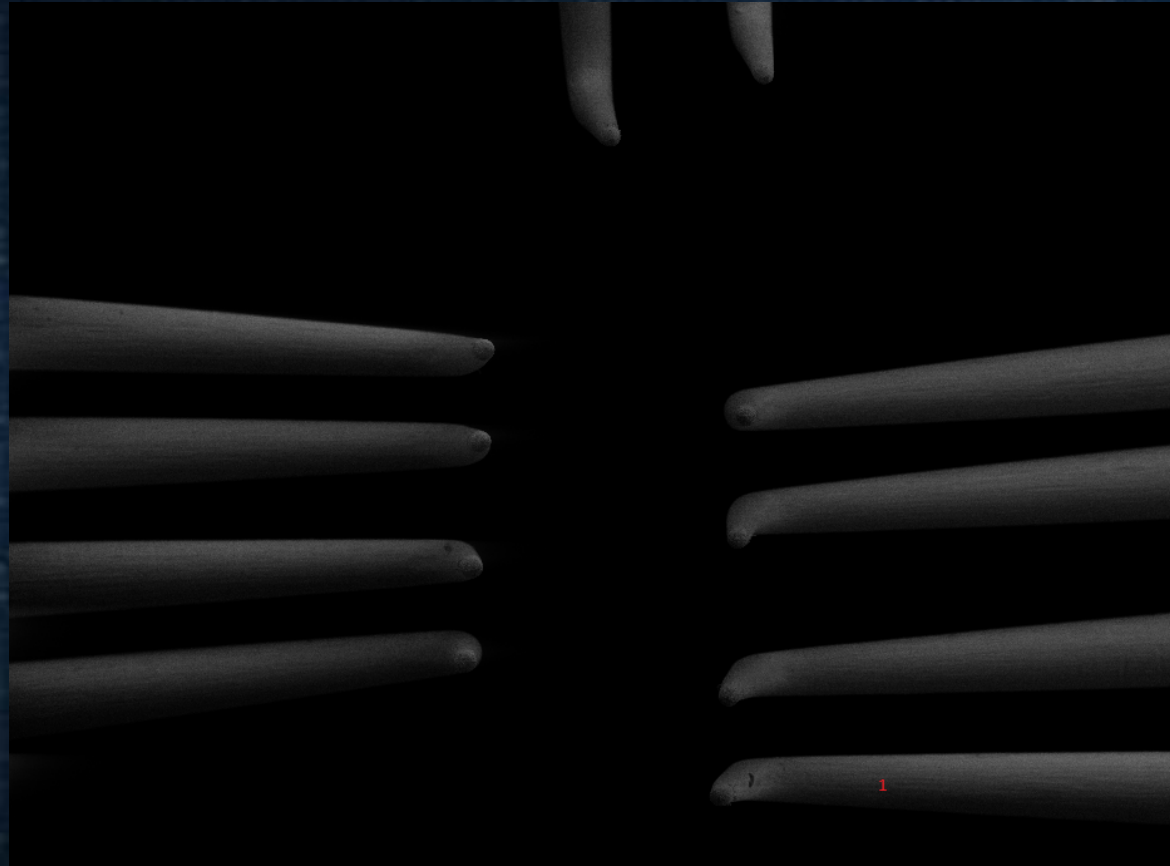
Cracks below bondpad



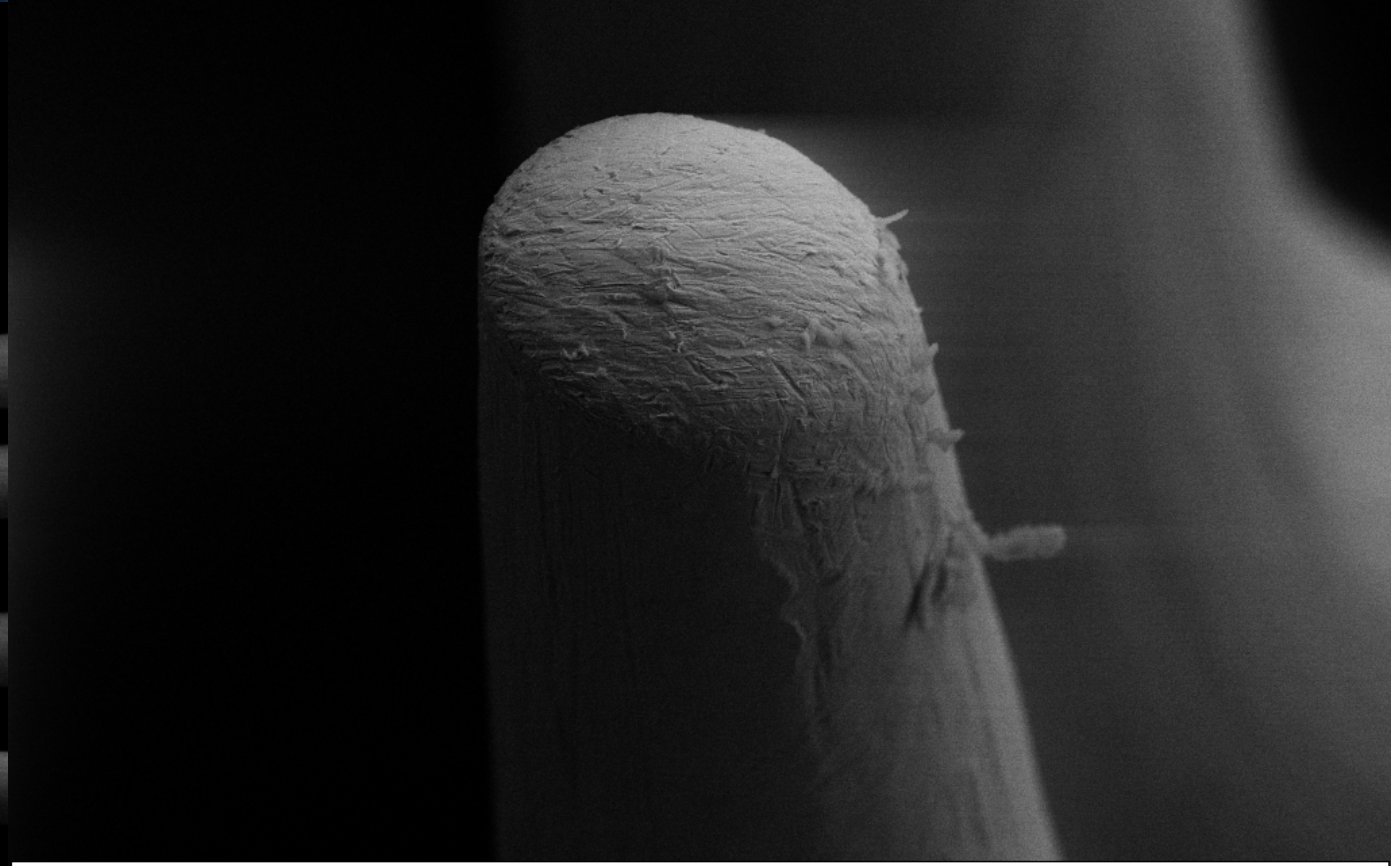
No Cracking
found
for both
technologies

Needle Shape

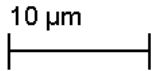
- Pictures Canti3 after ~ 1Mio TDs



Freising Device Analysis Operation
EHT = 10.00 kV Date :16 Feb 2018

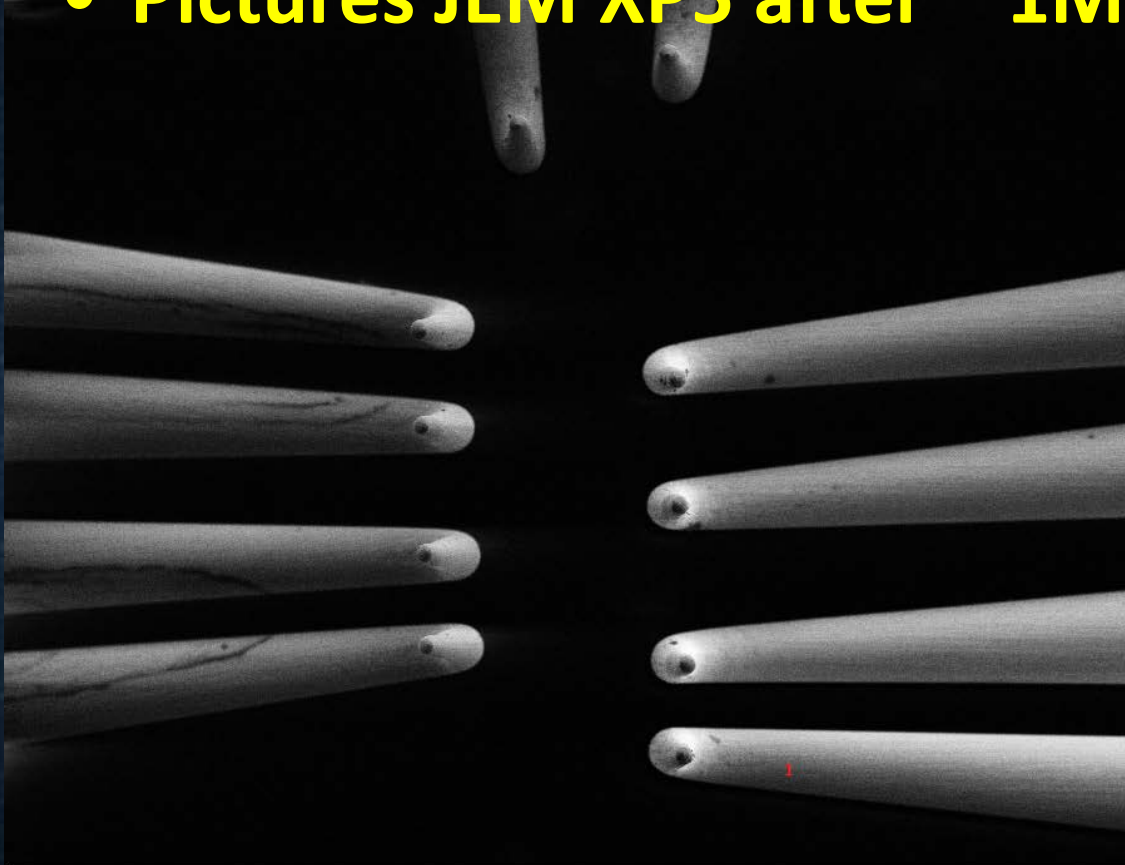


Freising Device Analysis Operation
EHT = 10.00 kV Date :16 Feb 2018



Needle Shape

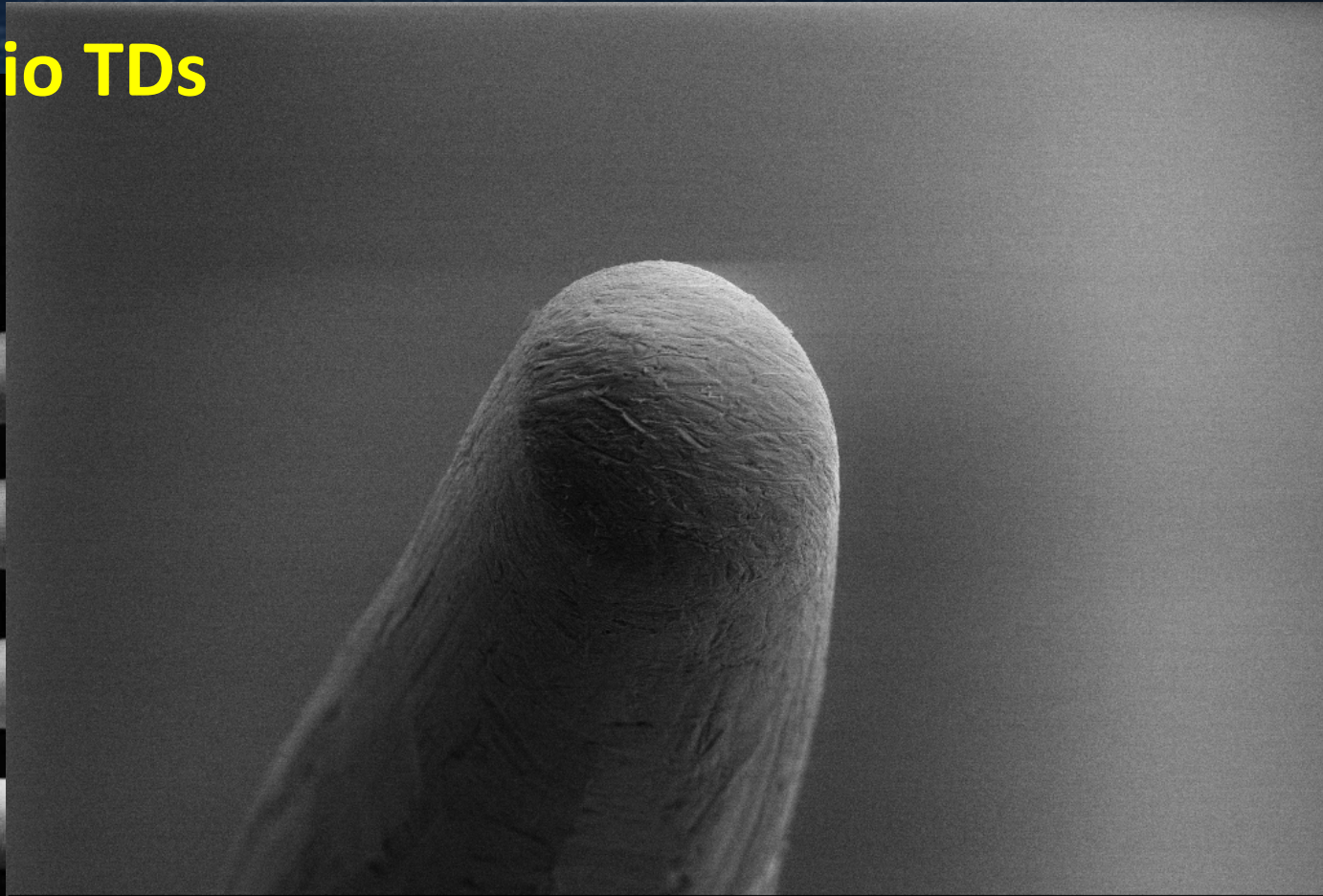
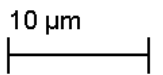
- Pictures JEM XP5 after ~ 1Mio TDs



Freising Device Analysis Operation
EHT = 10.00 kV Date :16 Feb 2018

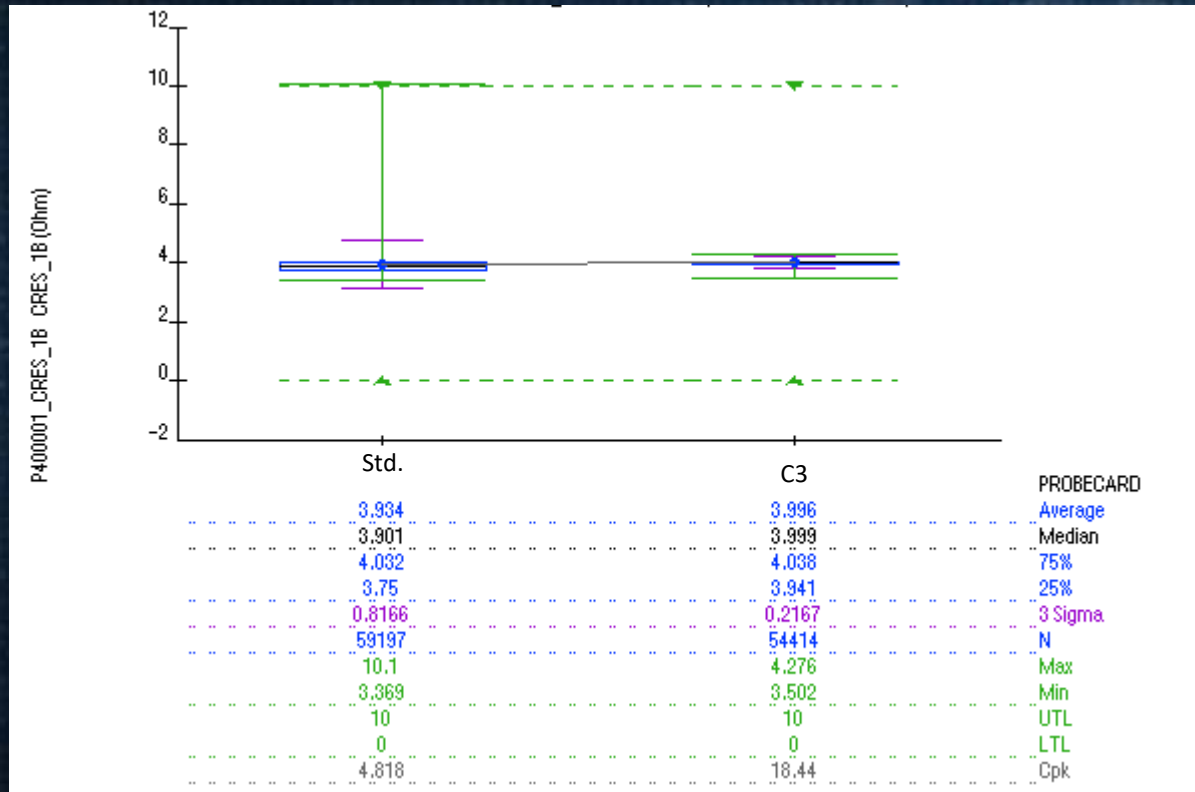


Freising Device Analysis Operation
EHT = 10.00 kV Date :16 Feb 2018

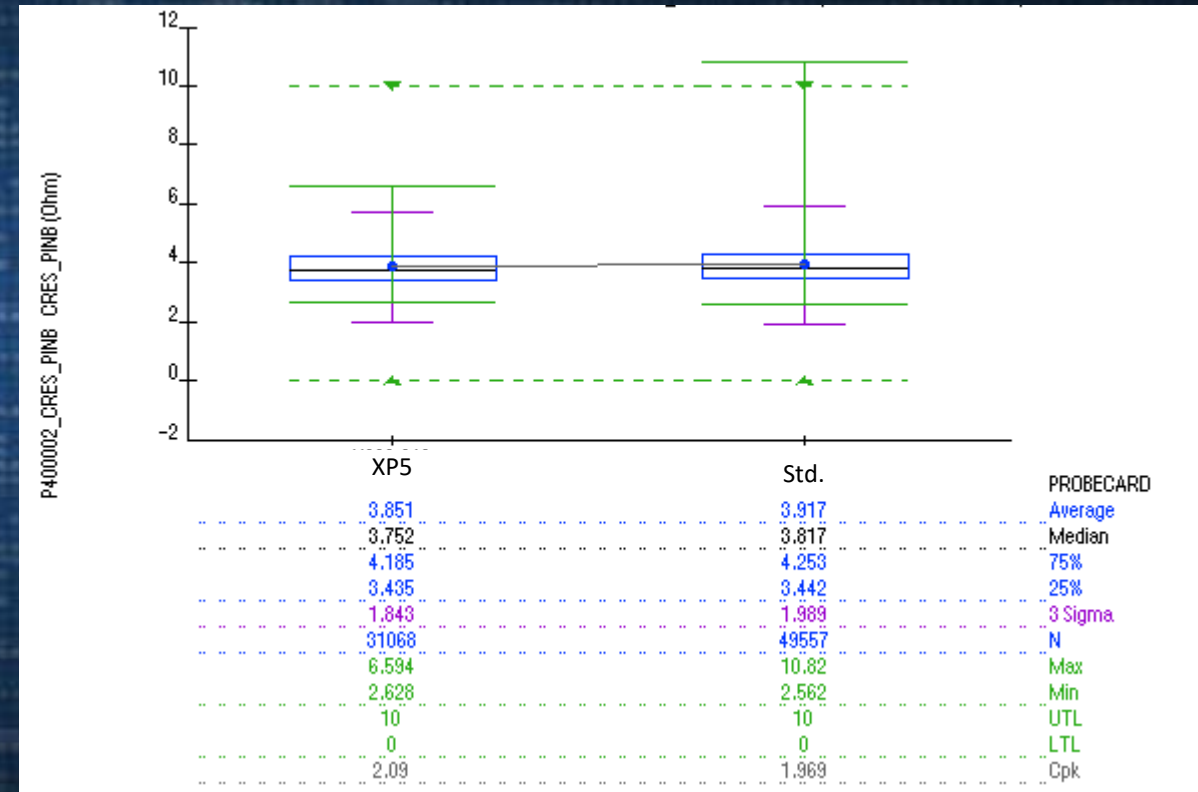


Electrical contact

Standard Cantilever vs. Canti3

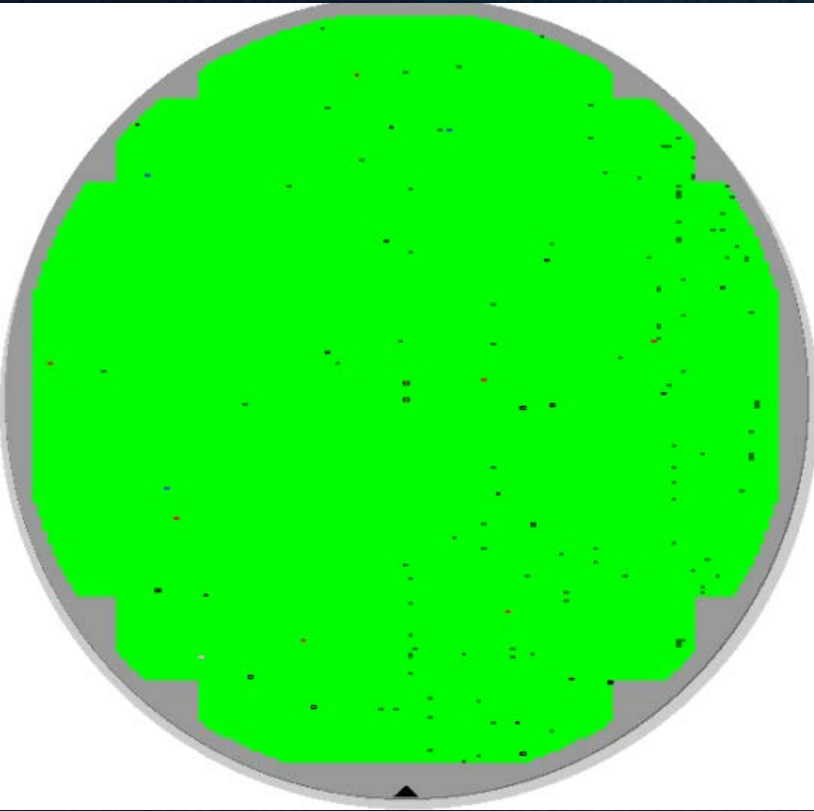


JEM XP5 vs. std. Cantilever



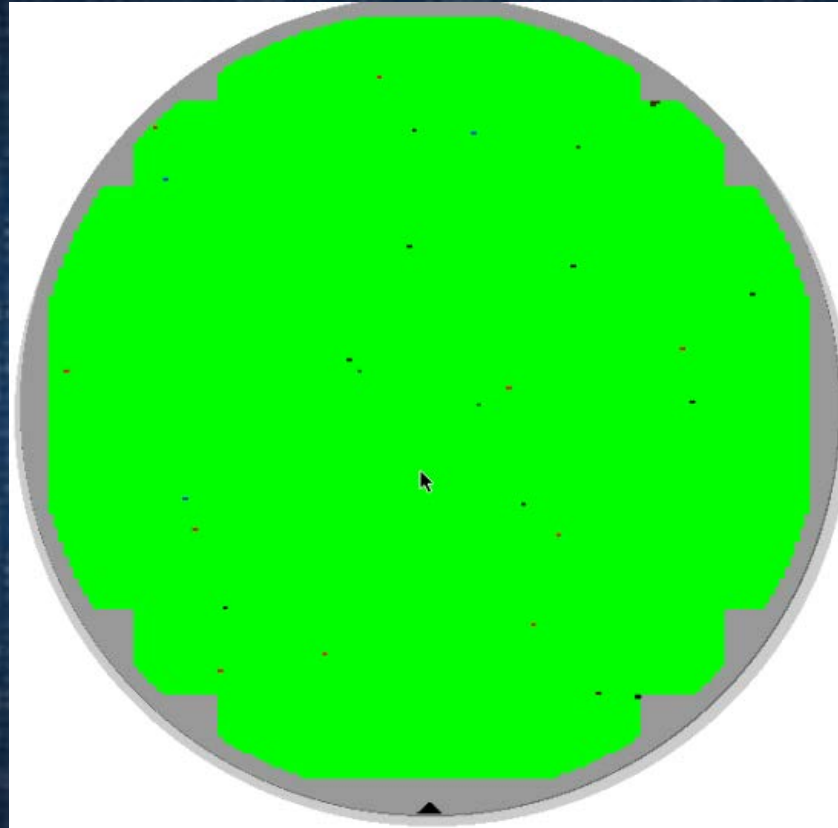
Probe Yield compare

Std. Canti
@45um OT



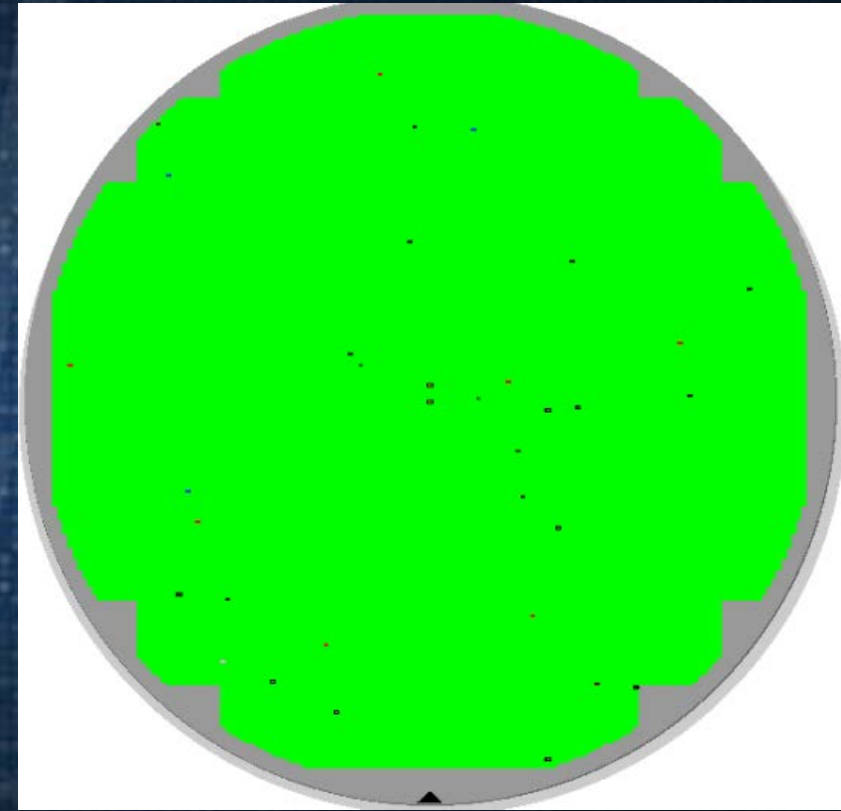
99.60%
Optical Loss: 400 units

CANTI3
@35um OT



99.92%
Optical Loss: 100 units

JEM XP5
@35um OT



99.93%
Optical Loss: 120 units

Long term study

- **Production Interruption**

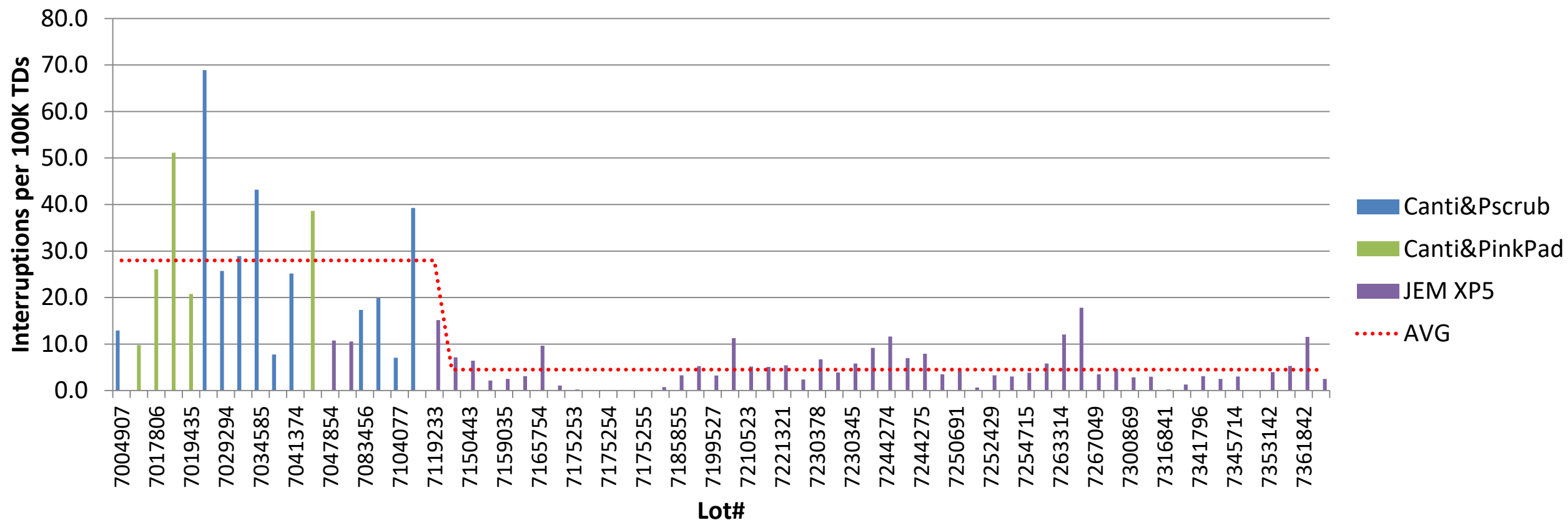
- Cantilever vs. JEM XP5
- Cantilever vs. Techoprobe Canti 3

- **Life time**

- JEM XP5
- Techoprobe Canti 3

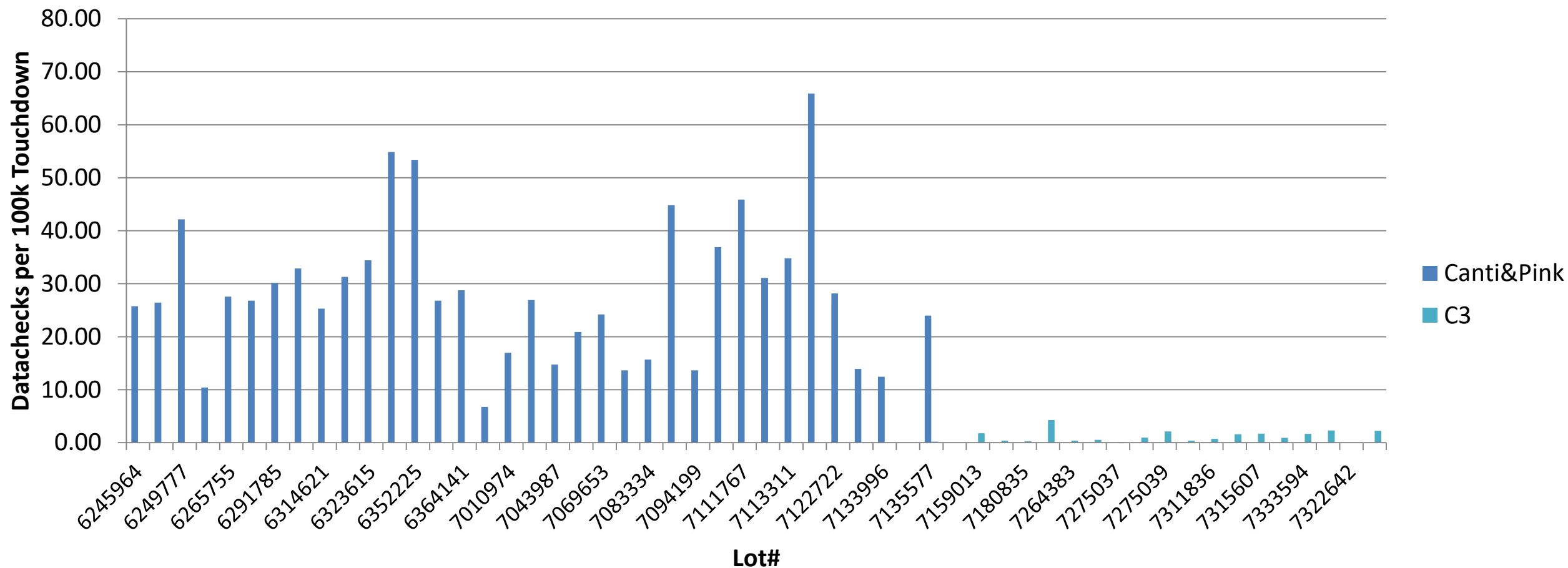
Production interruptions

Average Interruptions per 100k Touchdowns within one Lot



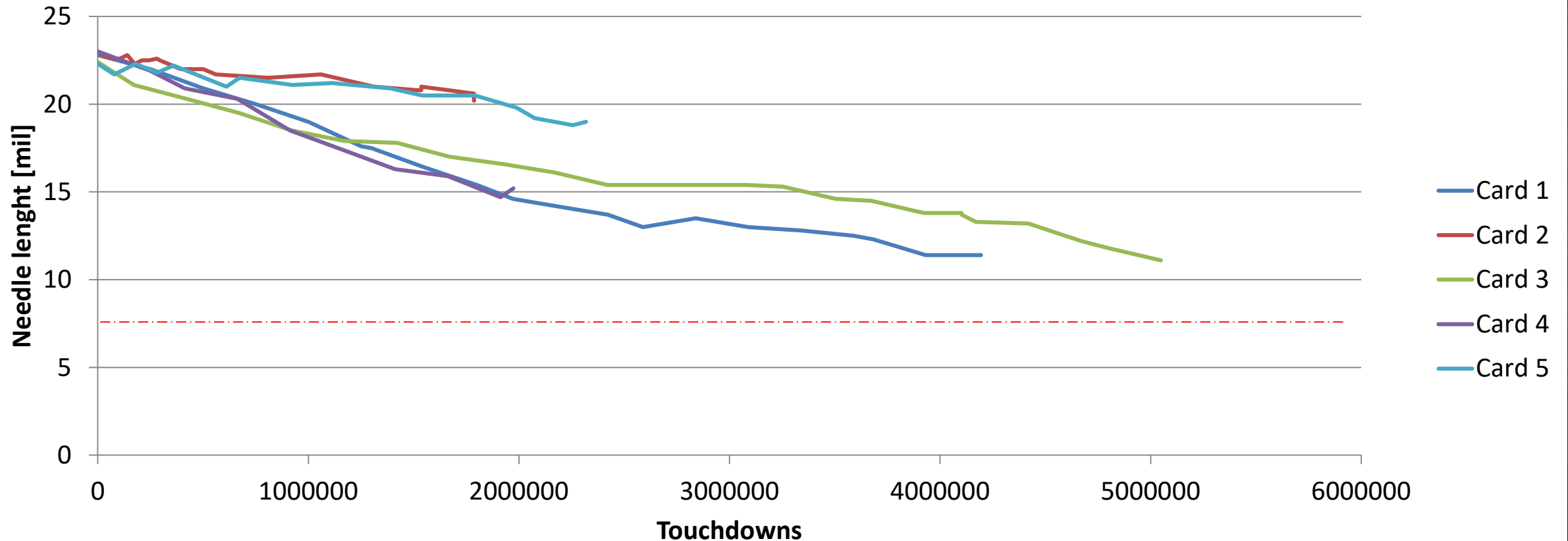
Production interruptions

Average Interruptions per 100k Touchdowns within one Lot



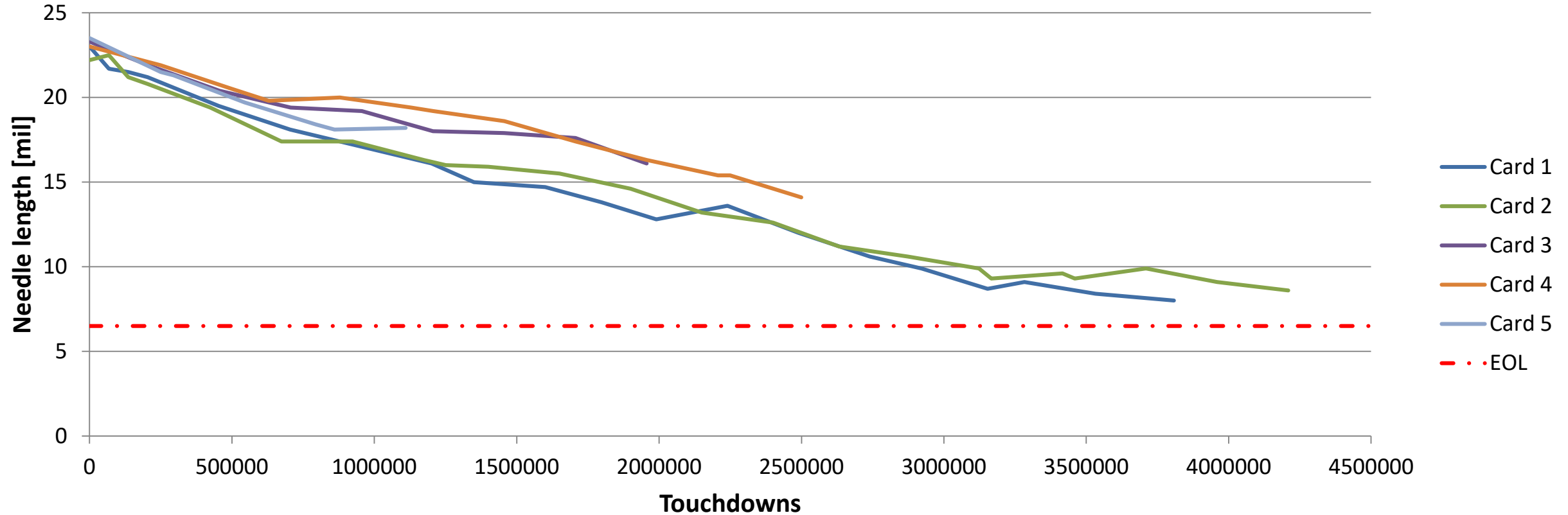
Life time

Lifetime JEM XP5



Life time

Lifetime Canti 3



Summary & Conclusion

- Both solution superior to standard cantilever

Category	Technoprobe Canti 3	JEM XP5
Mechanical stability	Slightly weaker	Slightly harder
Lifetime	~ 4 mio +	~6.5 mio +
Contact resistance	Most stable, slight offset	Lower and also very stable
Scrub mark	Close to vertical	
Cost (*)	2x	4x



Very contact sensitive products...



Very high volume products

(*) compared to std. cantilever. For >100 pins cost get even closer to cantilever

Acknowledgement

Special thanks to

- **JEM (Japan Electronic Material) Europe:**
 - Joe Mai
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- **Texas Instruments Freising**
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