

# Mass test system for pixel sensors

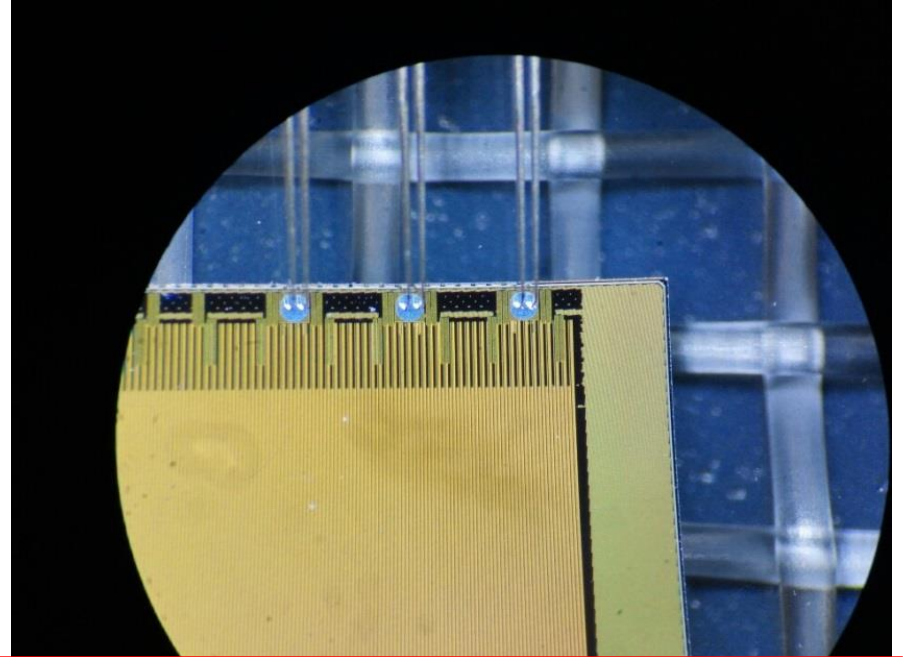
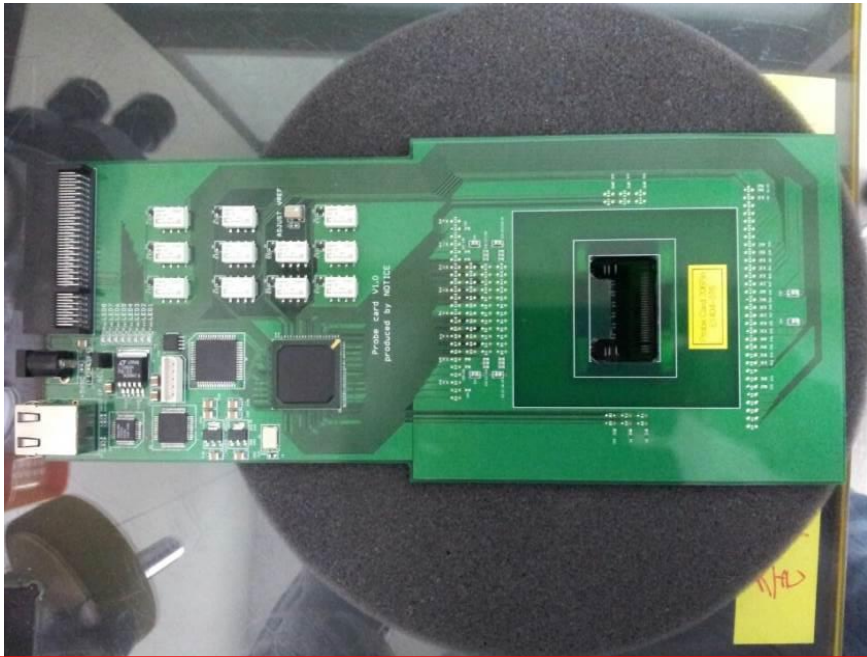
Y. Kwon

Yonsei Univ.

# Mass test system

- 50k chips with dimension 3 (cm) × 1.5 (cm) × 50 (μm)
- Electrical & optical test – how to make electrical contact?

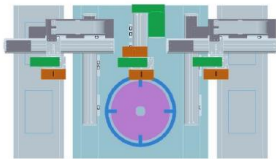




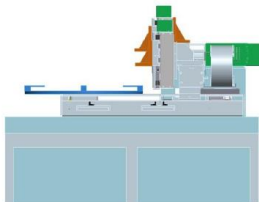
Confidential Information  
Development Proposa\_Q4.2014

▪ Concept modeling image/Brief design

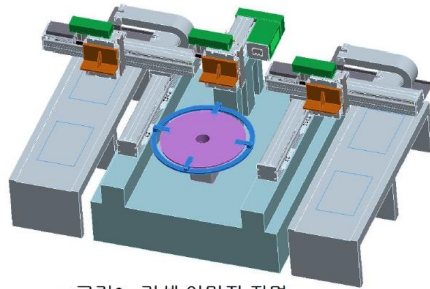
Concept stage



<그림1> 컨셉 이미지 상부

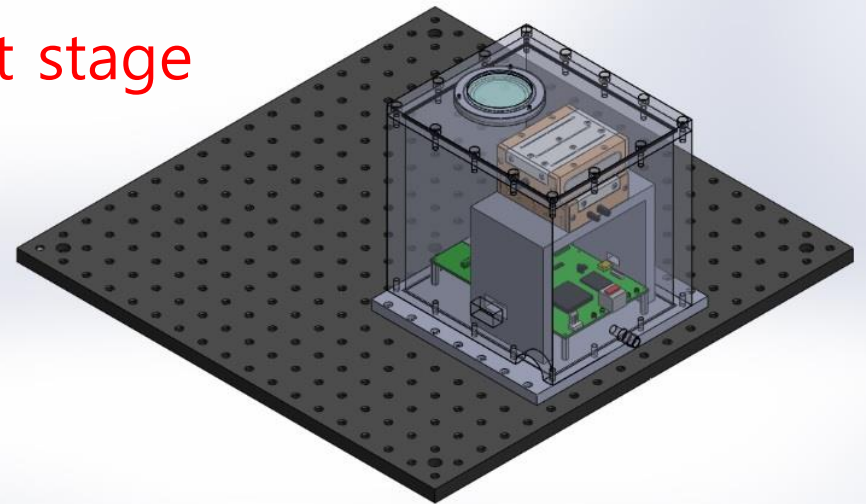


<그림2> 컨셉 이미지 우측



<그림3> 컨셉 이미지 전면

- Excepted housing and protection skin
- Safety lock and adjustment



**TEST STATION**

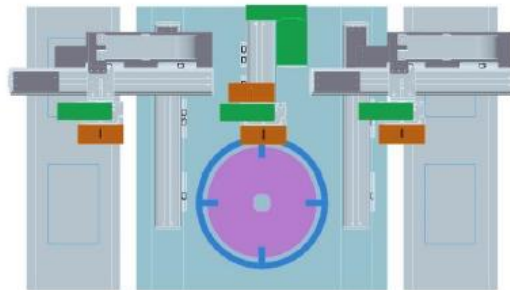
# Company 1 - EC3

- Small venture company of about 8 people.
- Quote for the system : 140k CHF
  - Machine vision
  - $5\mu \times 5\mu \times 5\mu$  accuracy

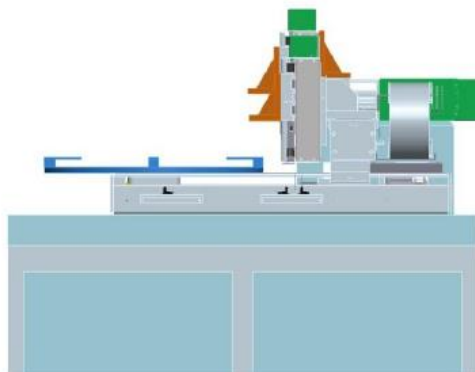
# Proposed design

- **Concept modeling image/Brief design**

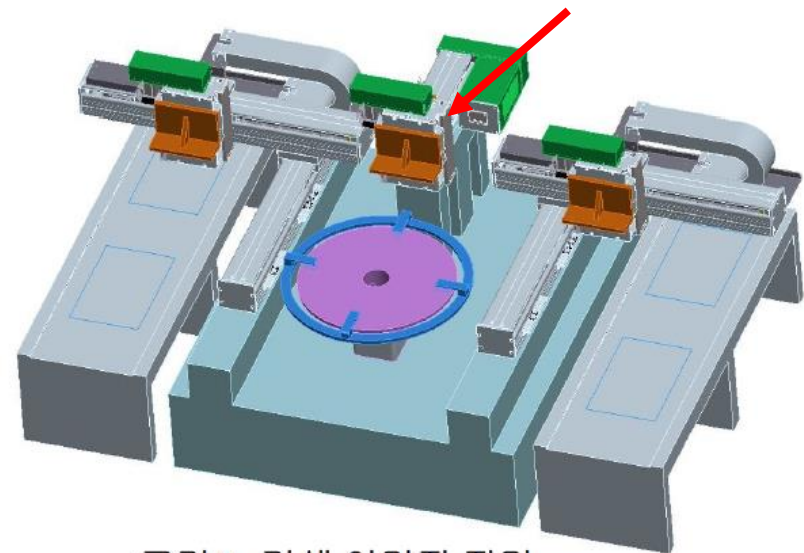
Accurate positioning system  
(main issue)



<그림1> 컨셉 이미지 상부



<그림2> 컨셉 이미지 우측



<그림3> 컨셉 이미지 전면

- Excepted housing and protection skin
- Safety lock and adjustment

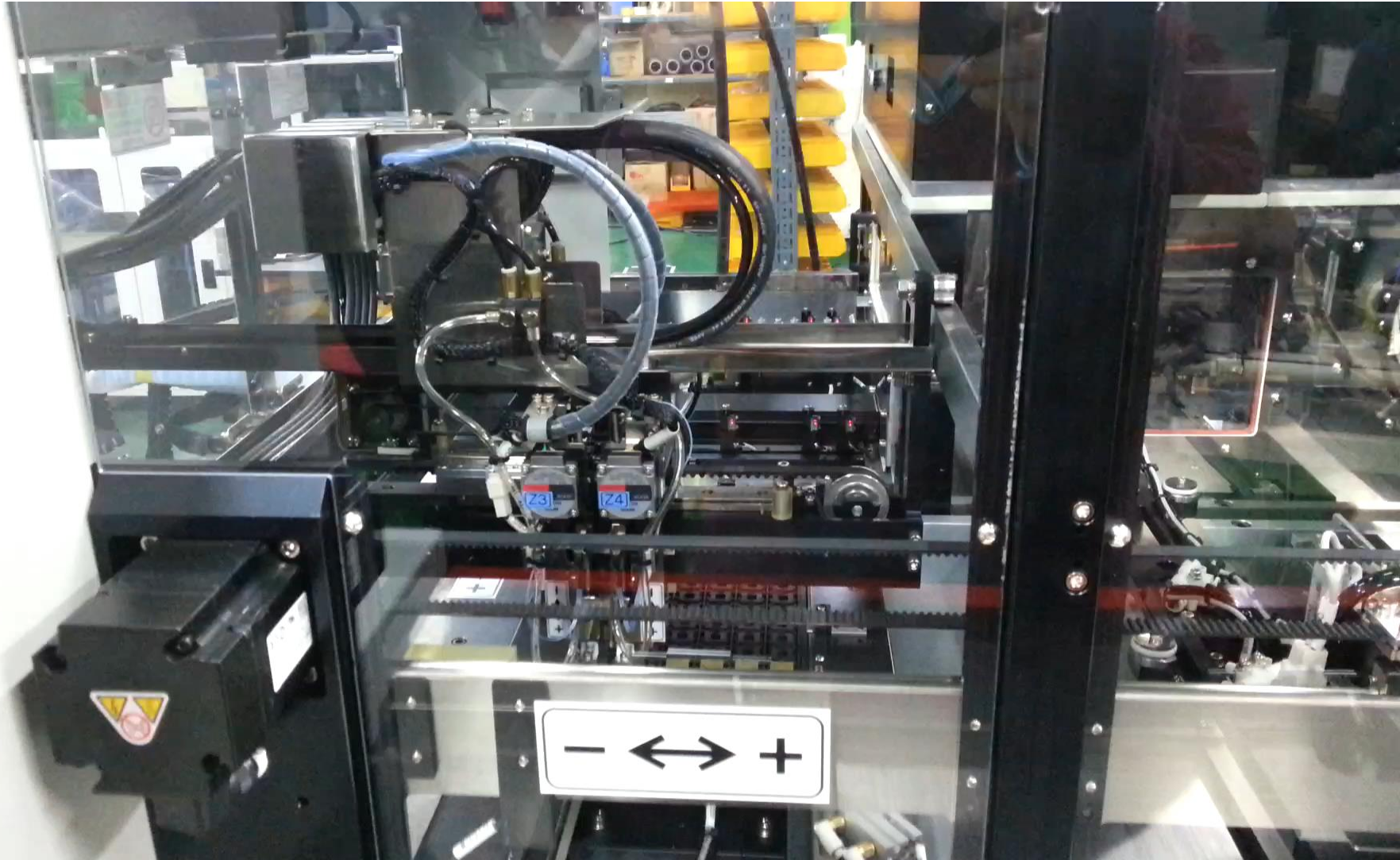


# Company 2 - GENESEM

- Si-chip post-processing experts
- Revenue ~\$100 M for 2013
- Ready-made products ~\$200k
  - Positioning accuracy :  $\sim 25\mu \times 25\mu$  (claim)
  - Interesting positioning system

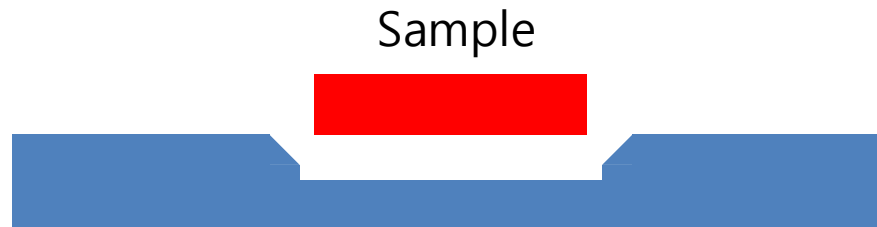


# Genesem

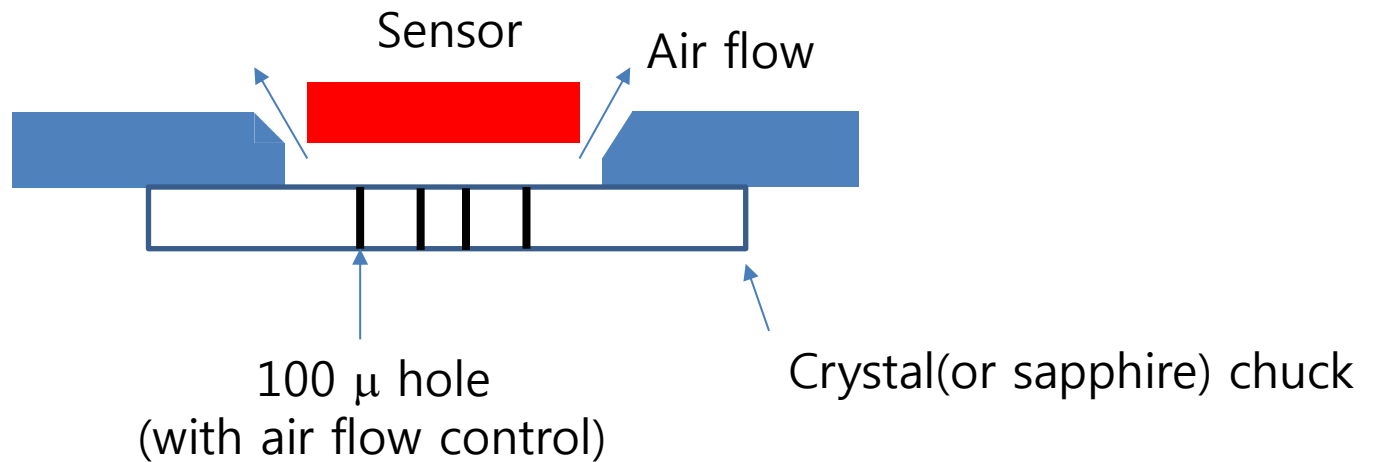


# Approach 2

## GENESEEM scheme



## Proposed scheme



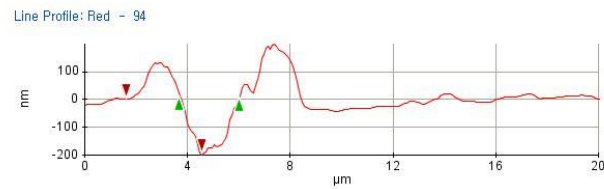
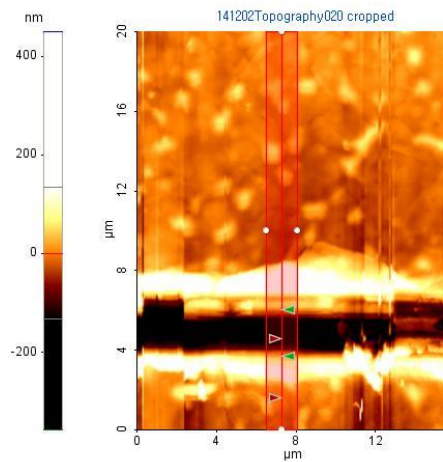
**NEEDLE (PROBECARD)**

# Information form Mr. Chang

- Material : 80  $\mu\text{m}$  ReW (Rhenium Tungsten Alloy)
- Tip Diameter : 9  $\mu\text{m}$
- Depth : 6 mm
- Beam Length : 3 mm
- Bending angle :  $101^\circ$

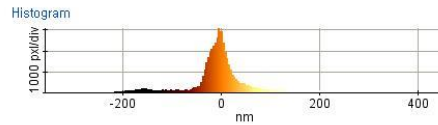
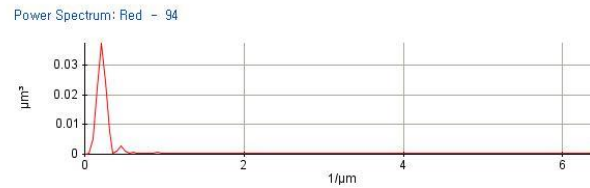
# Scratch on pad - normal

## AFM



Cursor Statistics : Red

Cursor	$\Delta X(\mu\text{m})$	$\Delta Y(\text{nm})$	Angle(deg)
Red	2.944	-196.279	-3.815
Green	2.339	-2.447	-0.060

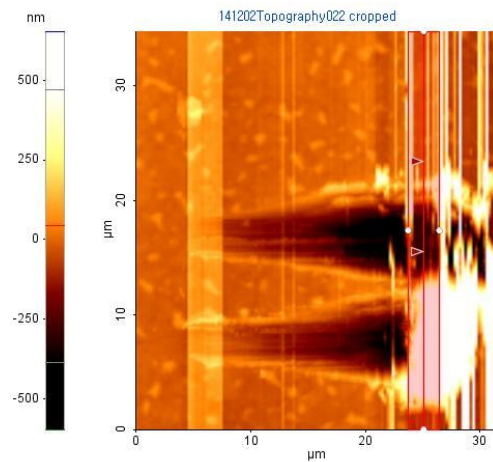


Statistics

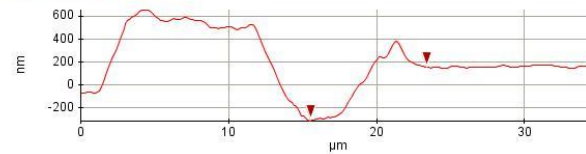
Line	Min(nm)	Max(nm)	Mid(nm)	Mean(nm)	Rp(nm)	Rq(nm)	Ra(nm)	Rz(nm)	Rsk	Rku
Red	-200.290	199.327	-0.481	0.000	399.617	71.957	45.572	266.738	-0.126	4.755

# Scratch on pad, abnormal

## AFM



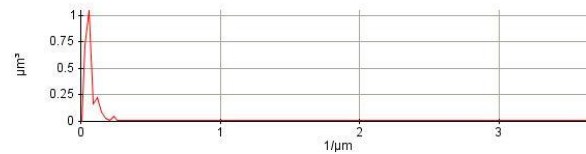
Line Profile: Red - 108



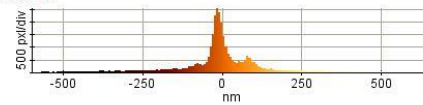
Cursor Statistics : Red

Cursor	ΔX(μm)	ΔY(nm)	Angle(deg)
Red	7.841	463.730	3.384

Power Spectrum: Red - 108



Histogram



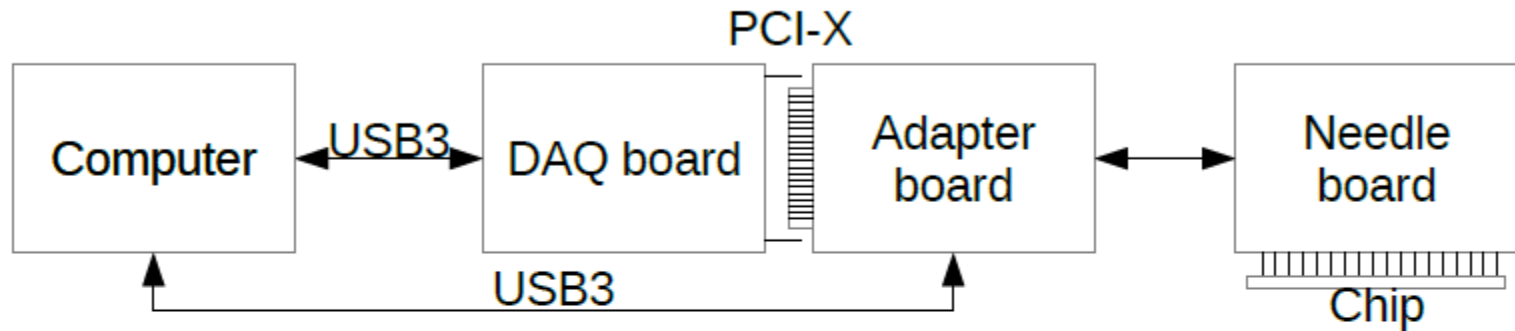
Statistics

Line	Min(nm)	Max(nm)	Mid(nm)	Mean(nm)	Rp(nm)	Rq(nm)	Ra(nm)	Rz(nm)	Rsk	Rku
Red	-318.522	651.295	166.386	201.696	969.818	258.614	201.927	746.623	0.140	2.357

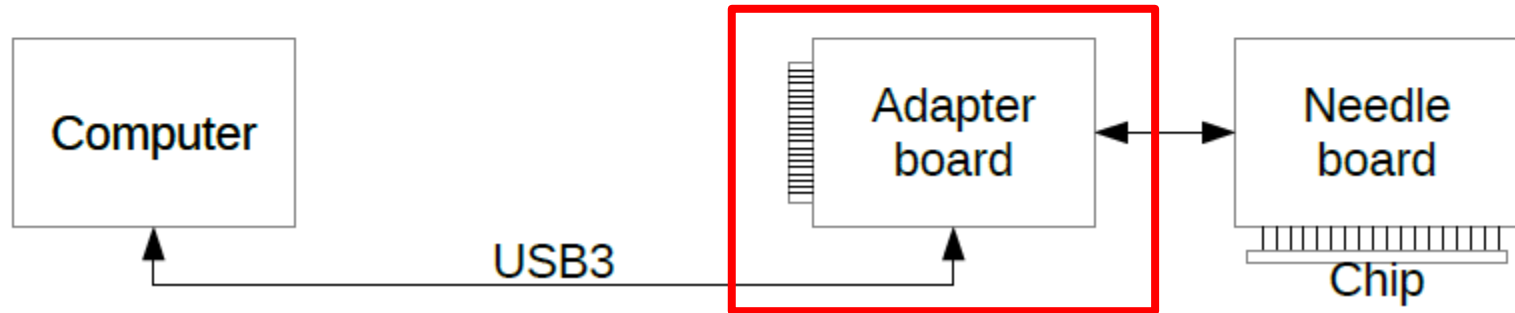
**BOARD (PROBE CARD,  
INTERFACE CARD)**

# Scheme

## Throughpass mode



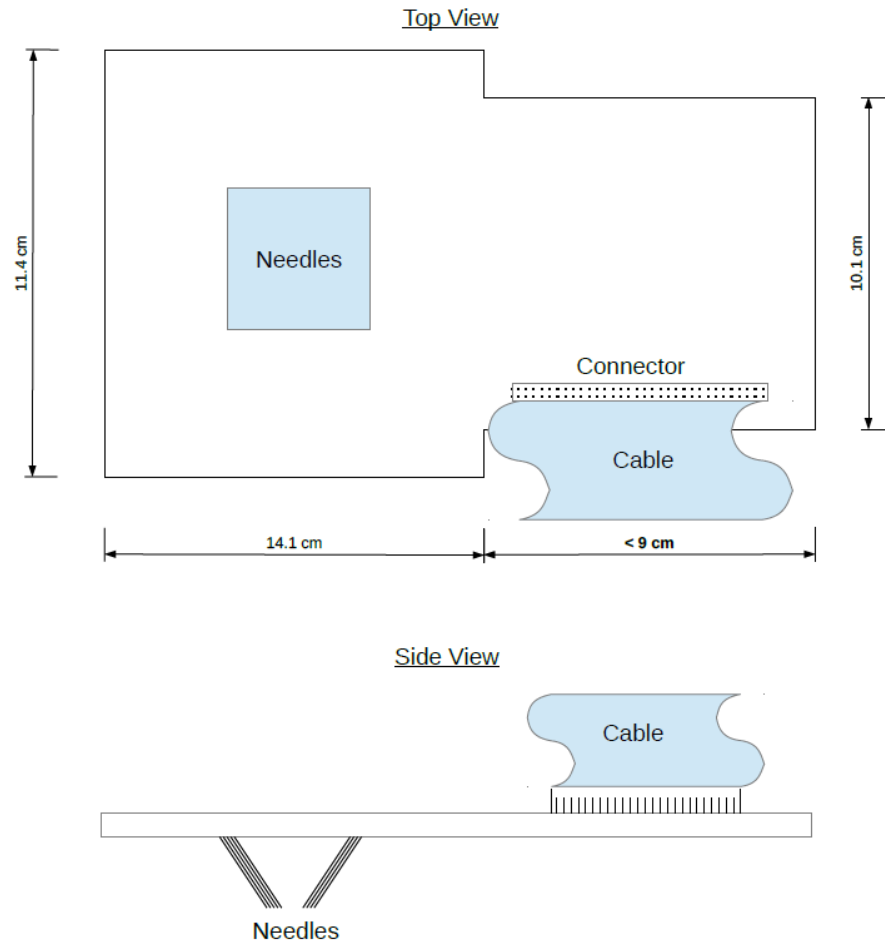
## Standalone mode





# Probe card

Efforts to make the board capable of handling 2.5 Gbps digital signal will be made.



# Interface board

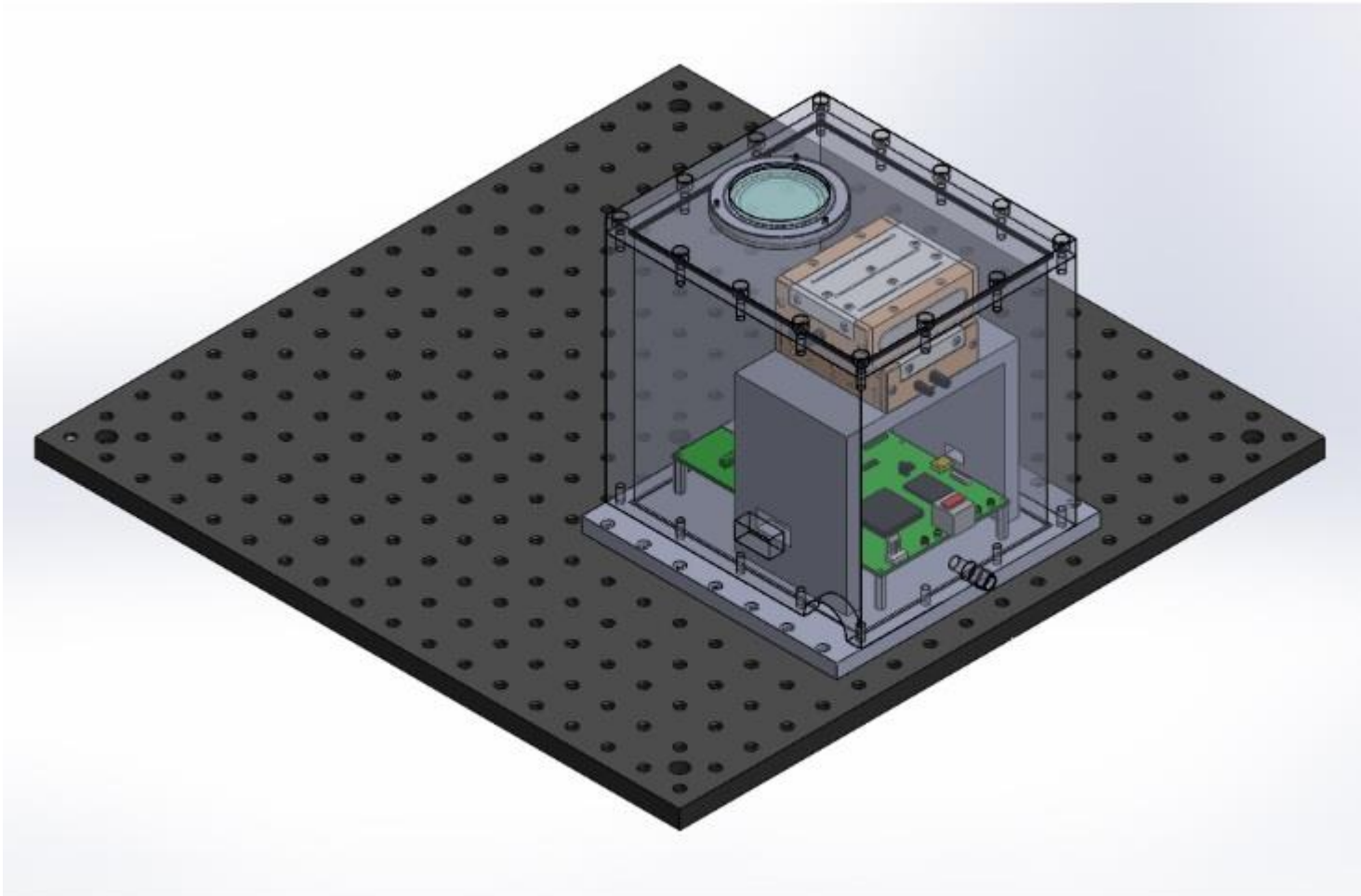
- Sangyeol of NOTICE
  - Enough experience, but currently occupied (customer support for KEK experiment)
  - 4 weeks estimated from Jan. 1<sup>st</sup> assuming KEK delivery is smooth.

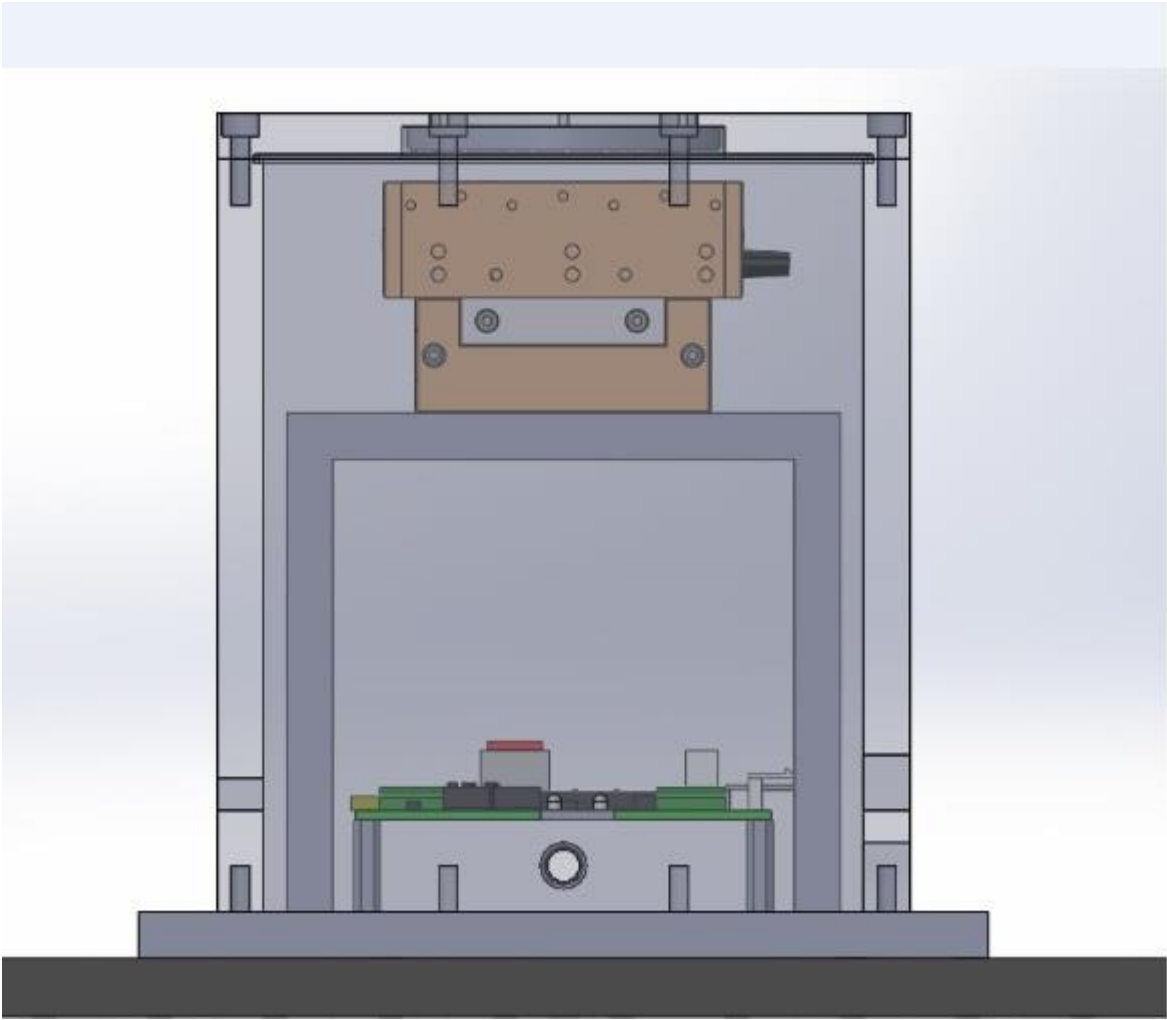
**TEST BOX**

# Target is ...

- Can we talk to the chip?
- What is the fraction of live pixels?
- Electrical test by the internal pulser.
- Optical test by backside laser illumination? ... Ideally, 3 minutes will do.

# Drawing by solidworks





# Summary

- Baseline scheme is defined.
- Details are shaping as sensor gets into the final shape.
- Speeding-up actions.