

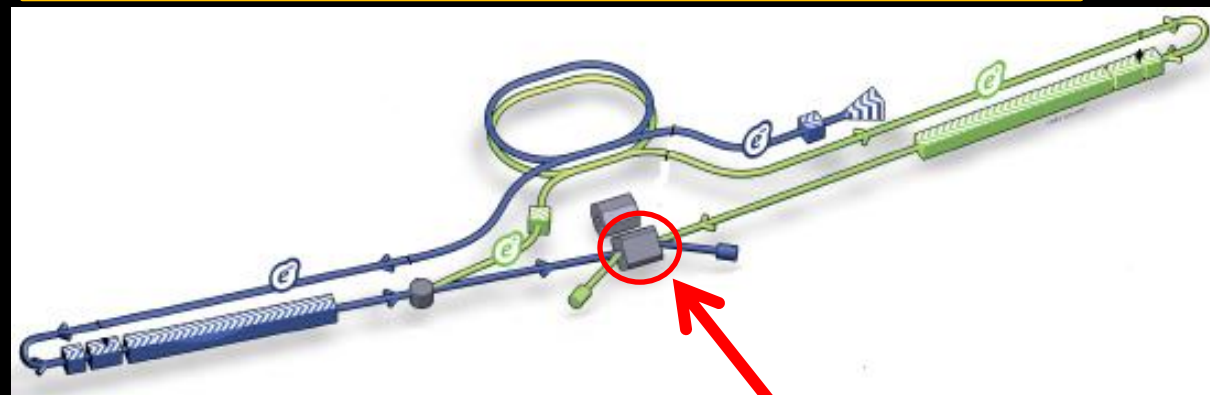
Laser Facility at Fuji B4 and Current Status of Distortion Study

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(based on JPS talk 2014/Mar., 28pTH-10)

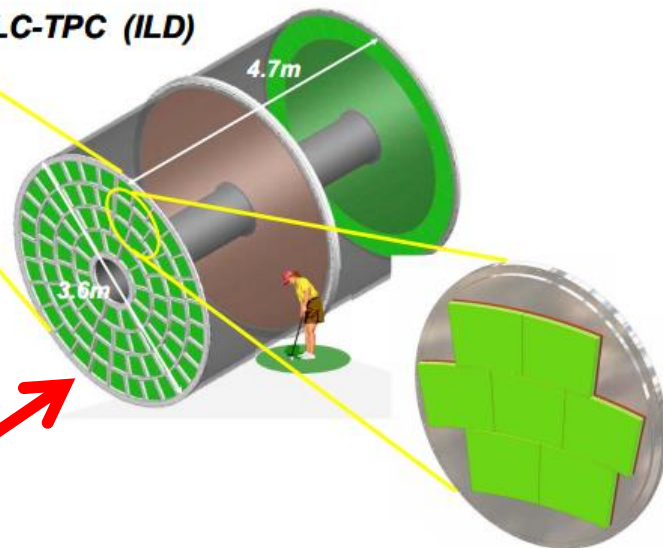
ILC (International Linear Collider)



ILD (International Large Detector)



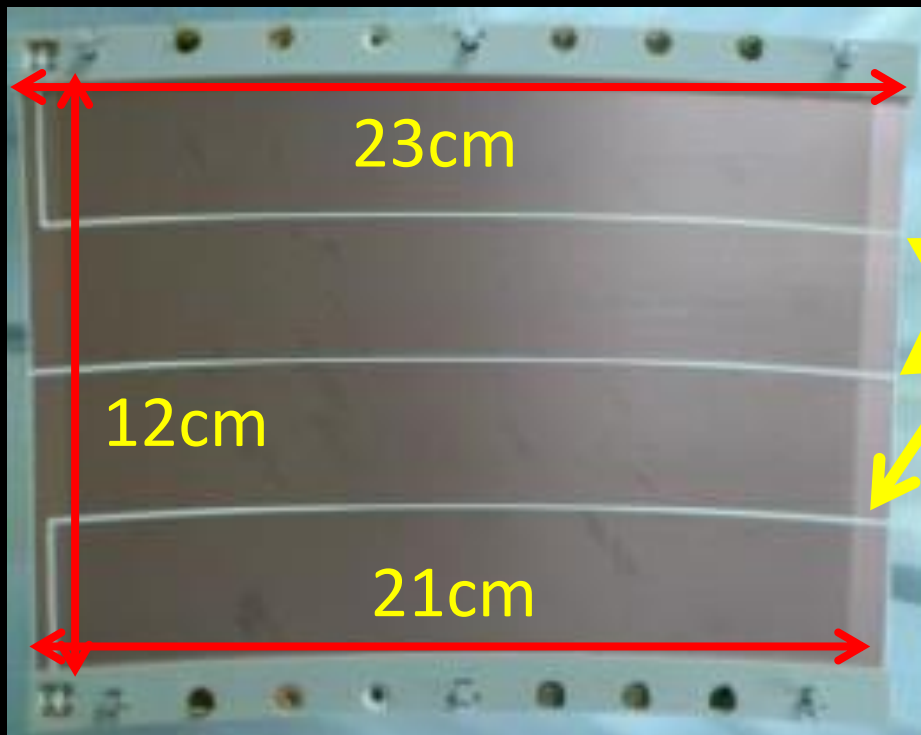
LC-TPC (ILD)



TPC (Time Projection Chamber)

TPC with using GEM

- We are developing a module using GEM (Gas Electron Multiplier).

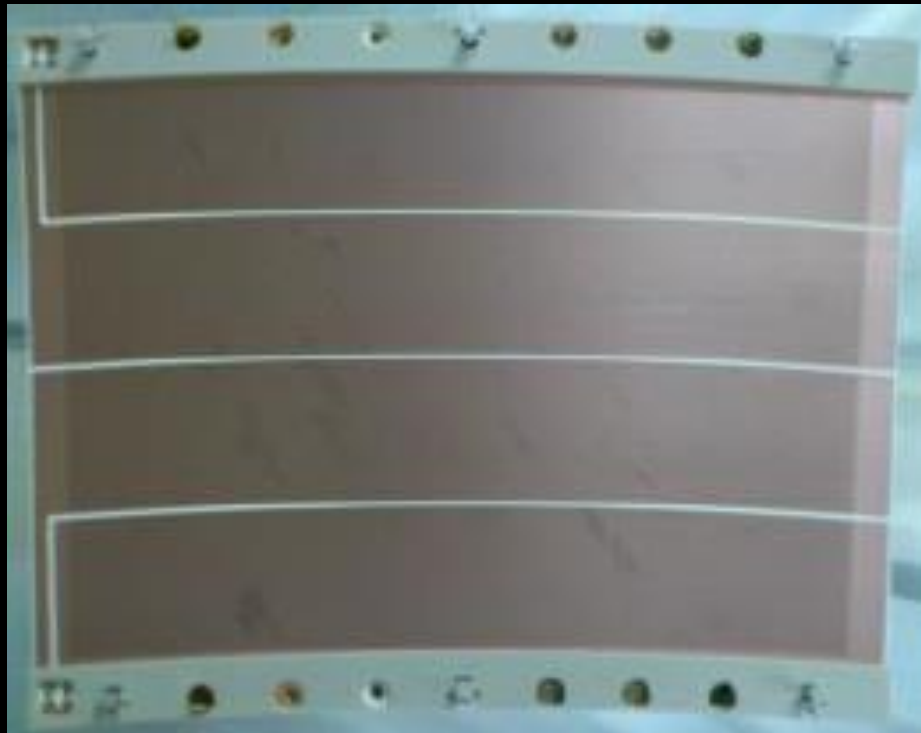


gap
in order to avoid the
breakdown caused by
discharge

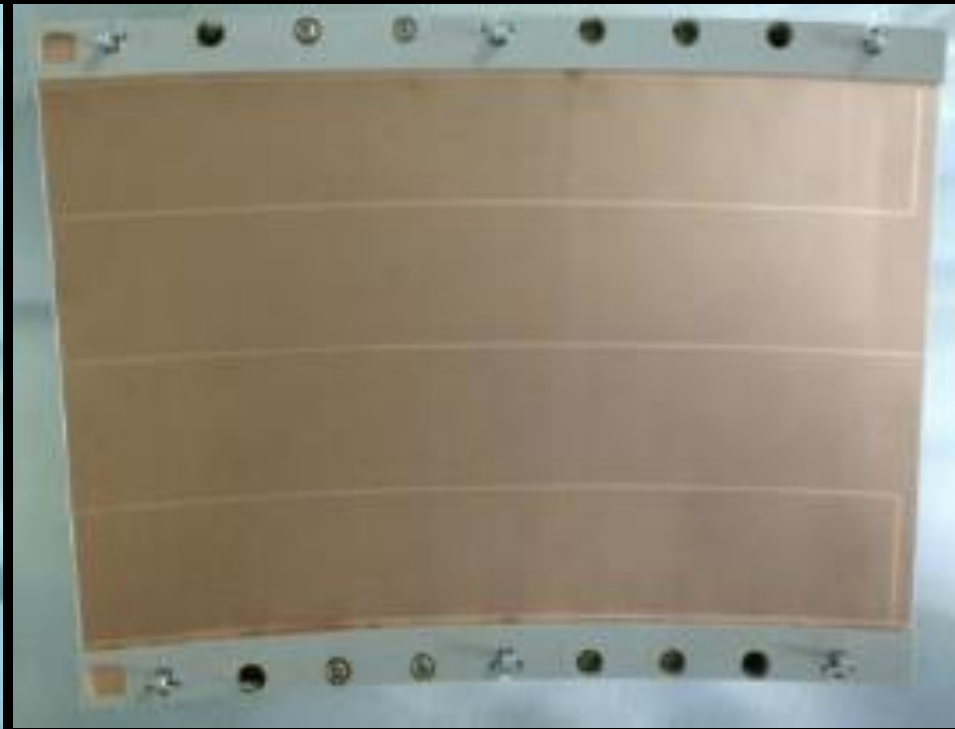
GEMs

Old GEM
(used at 2012 beam test)

New GEM



1mm gap in both side



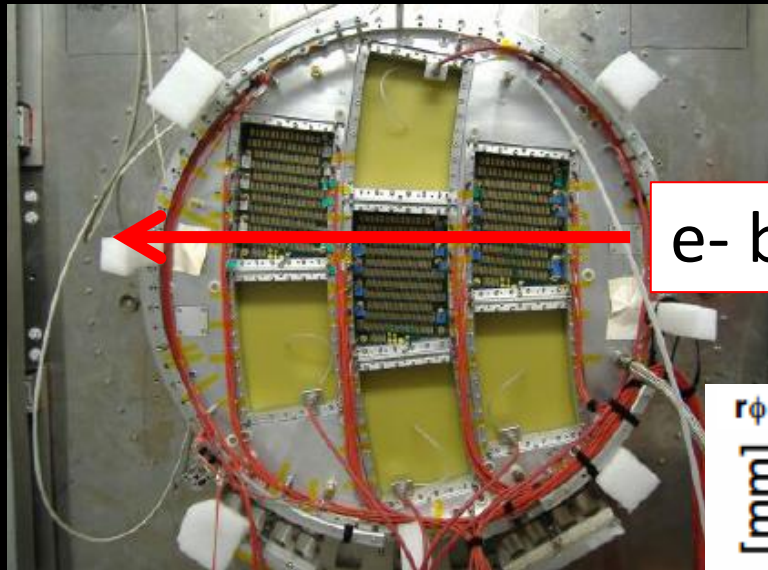
no gaps in front side
500um gap in back side

Issues of our GEM

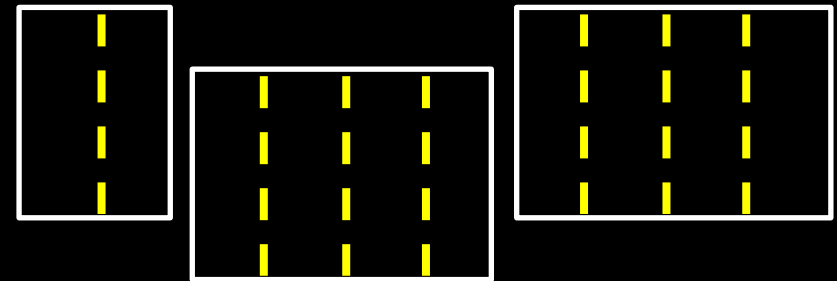
- GEM discharge
 - studying by Kato-san with various configuration
 - monitored data taken by Kawaguchi-kun
- Distortion
 - electrode gap
 - module boundary

Distortion

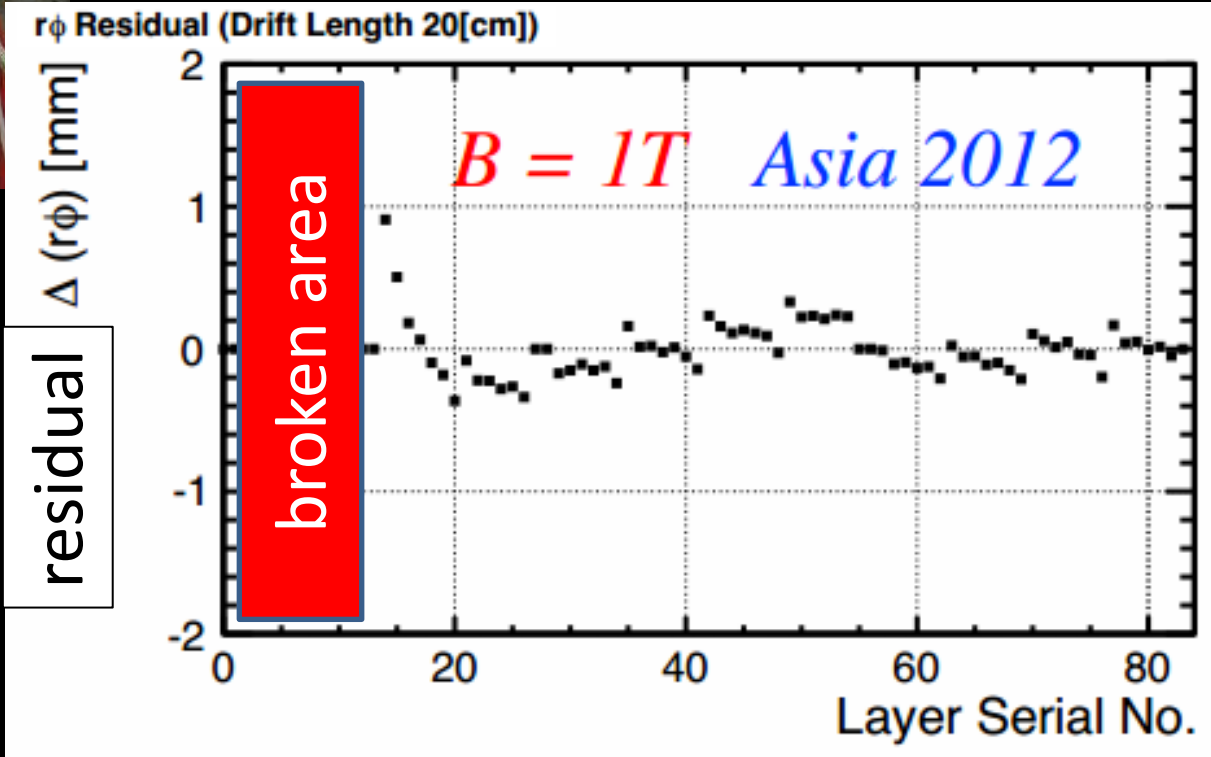
□ GEM
 - - - electrode gap



e- beam



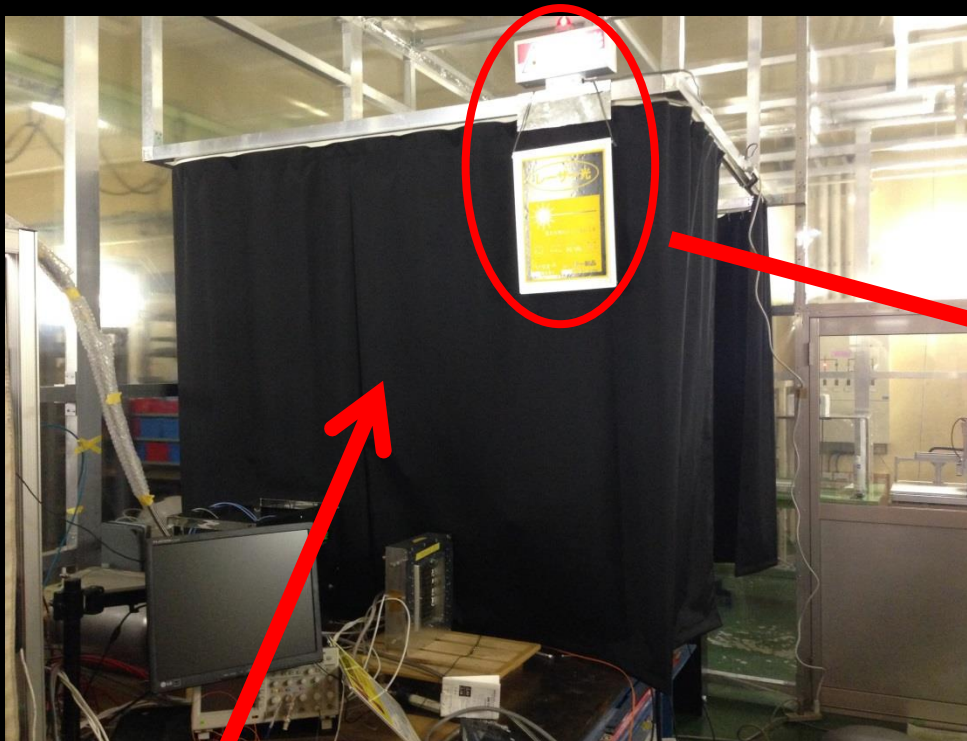
Distortions caused by
 (1): module boundary
 (2): electrode gap



Laser Facility at Fuji B4

We developed a laser facility for measuring distortion before the beam test.

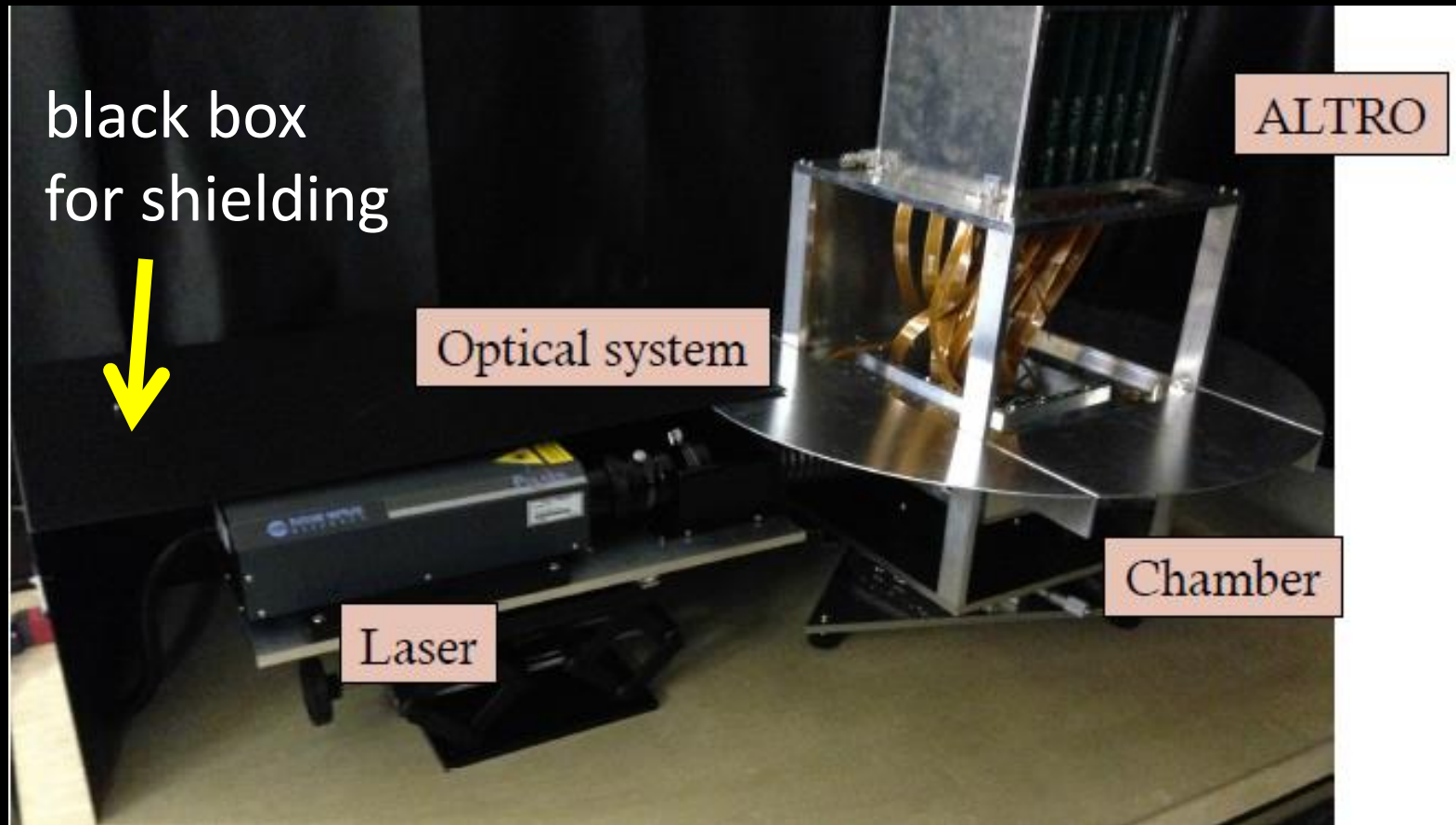
Curtain room
for laser facility



black curtain
for shielding

lamp and notification board
for using laser

Inside of Curtain Room



Laser

Ultra Violet laser

Nd-YAG laser

wavelength: 266 nm

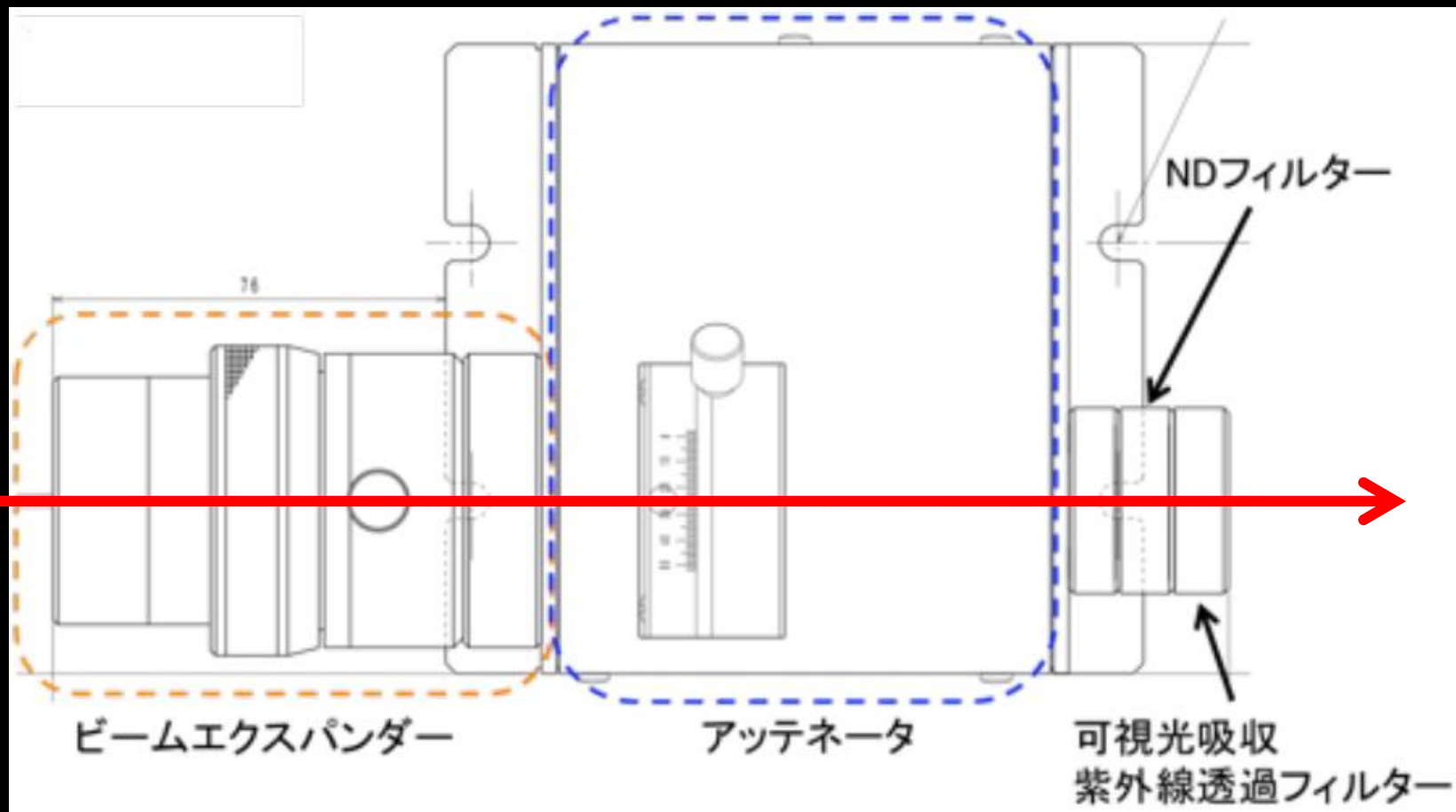
reputation rate : 1 - 20 Hz (operatable)

(typically 10 Hz or 20 Hz was used)



Optical System

(from Yatsukawa-kun's master thesis)



Chamber (Test Box)

Chamber size:

260mm × 320mm × 60mm

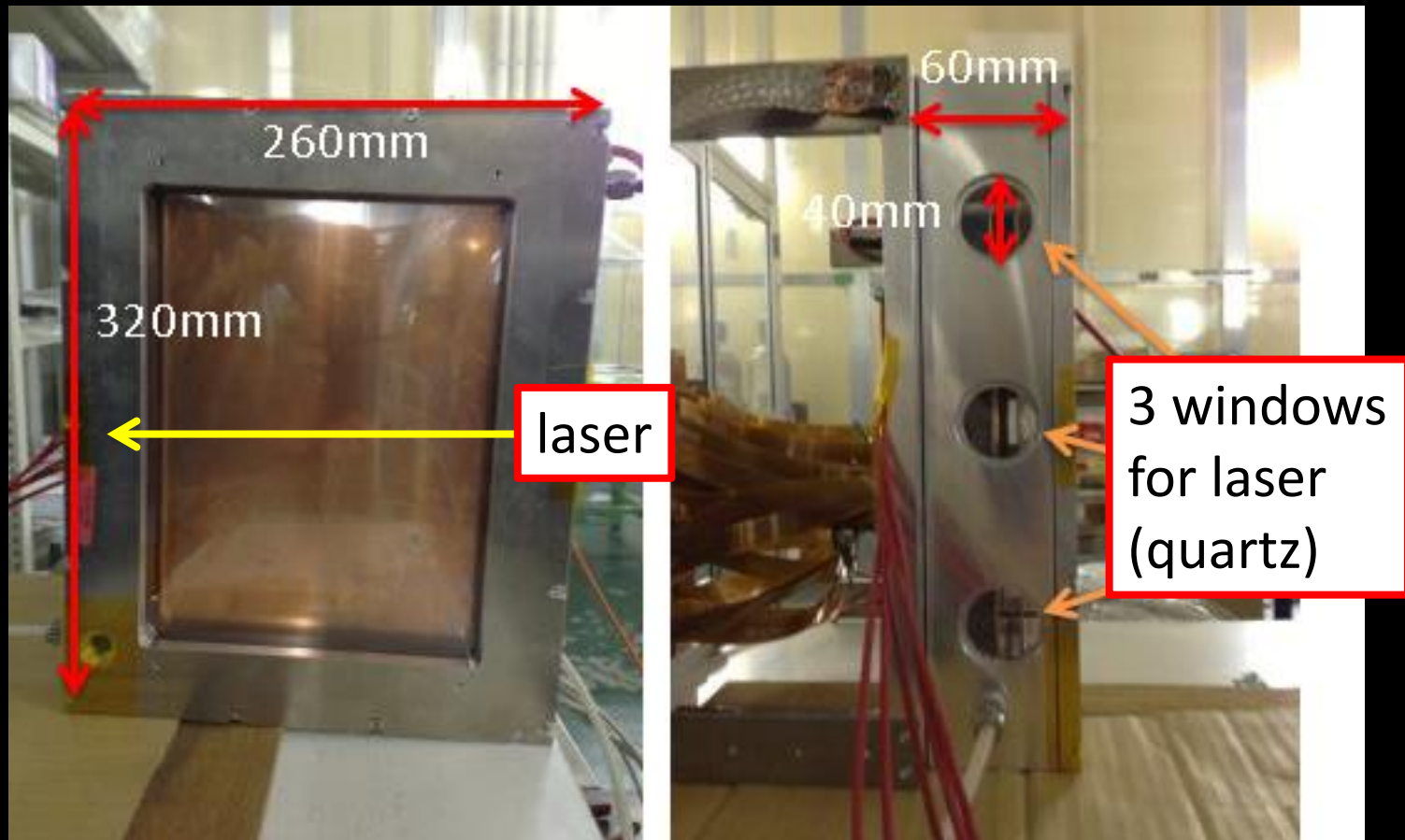
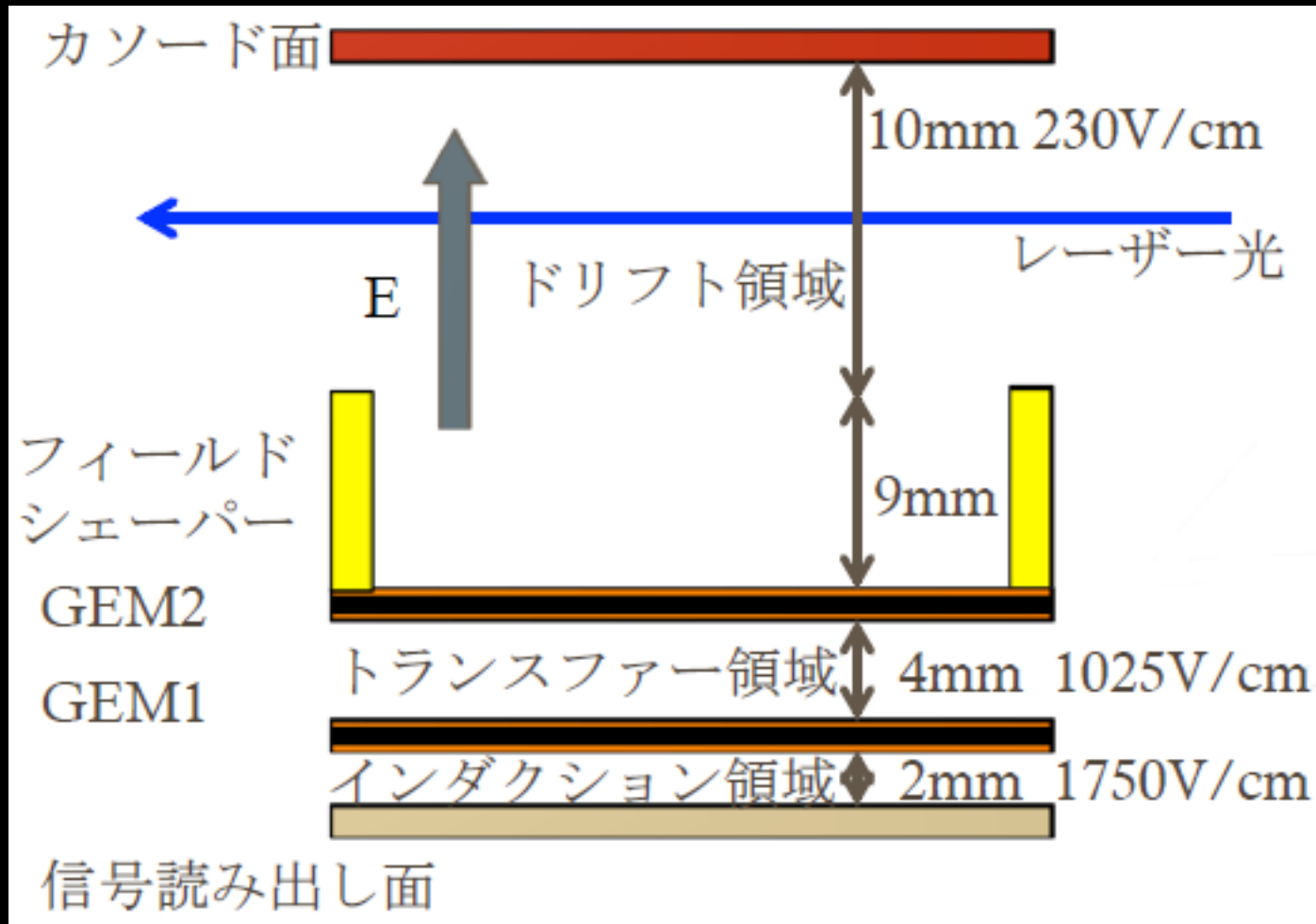


Image of Inside of Test Chamber



used T2K gas ($\text{Ar}:\text{CF}_4:\text{iC}_4\text{H}_{10} = 95:3:2$)

Setup of ALTRO & Test Box (from Yatsukawa-kun's master thesis)

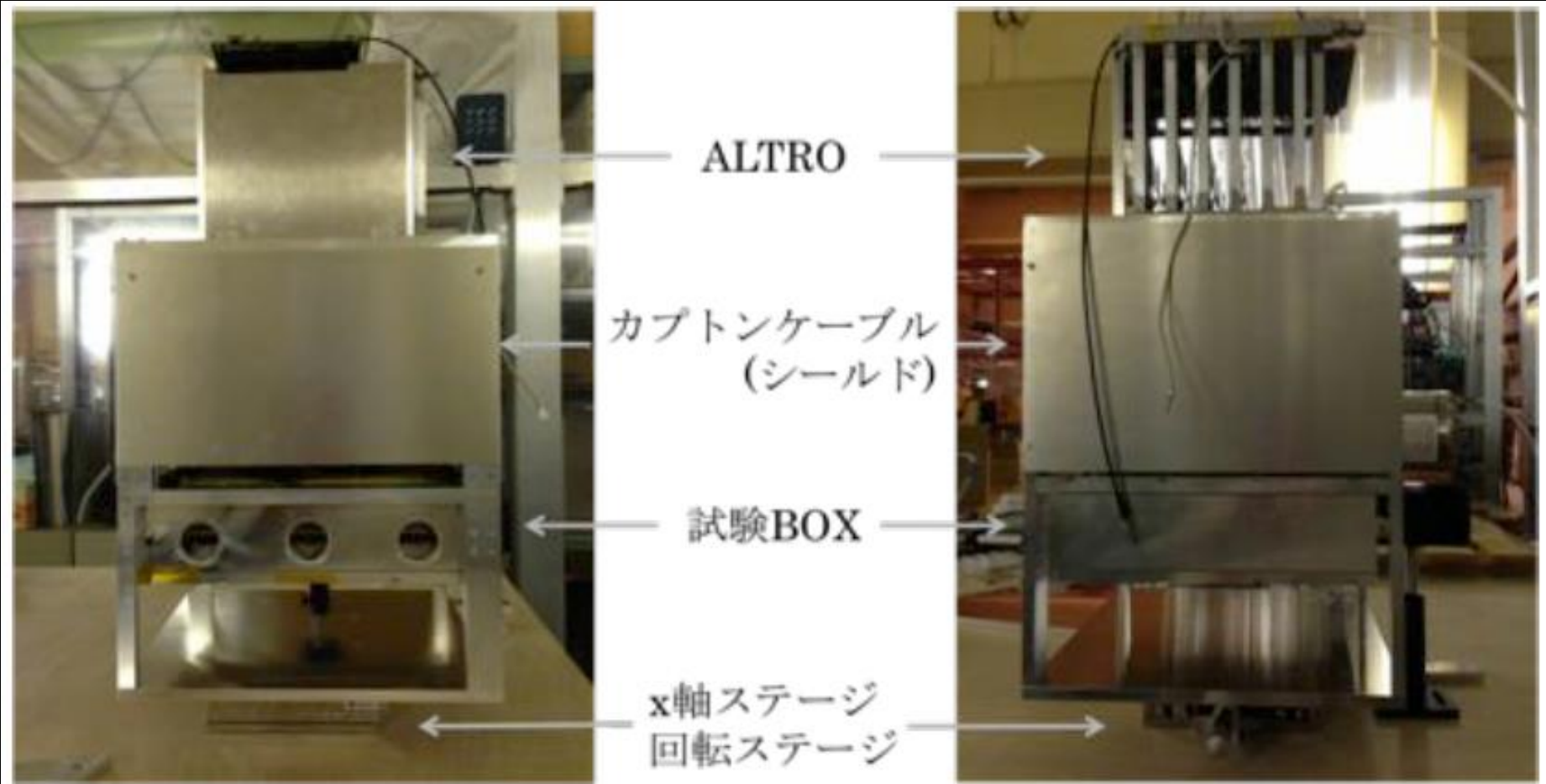
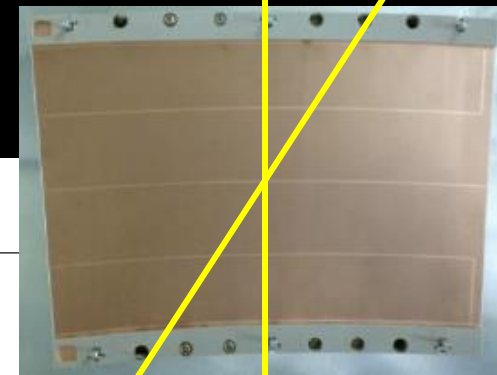


図 4.4.1 ALTRO+試験 BOX の写真(左：全面、右：側面)

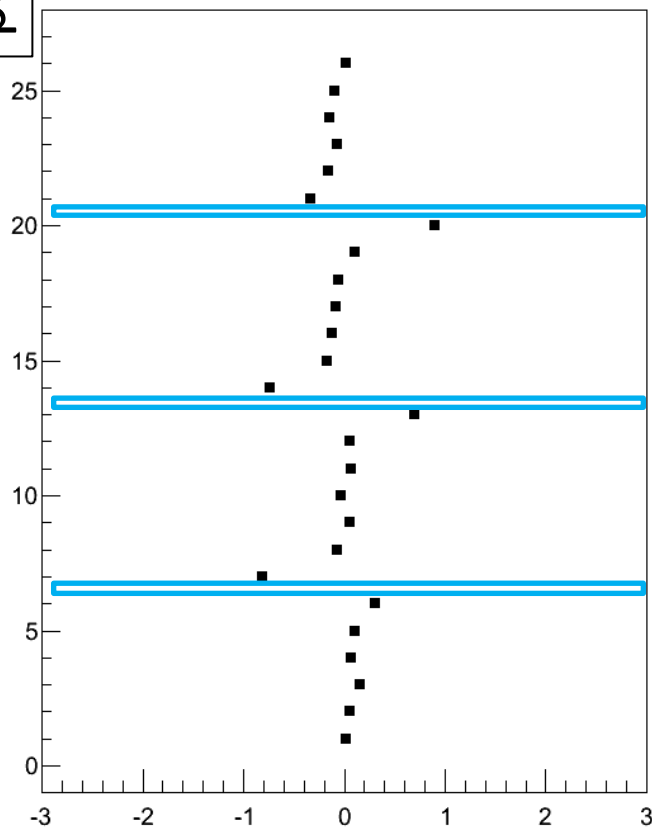
Angle Dependency of Residual 0° ϕ

old GEM
 $\phi = 20^\circ$

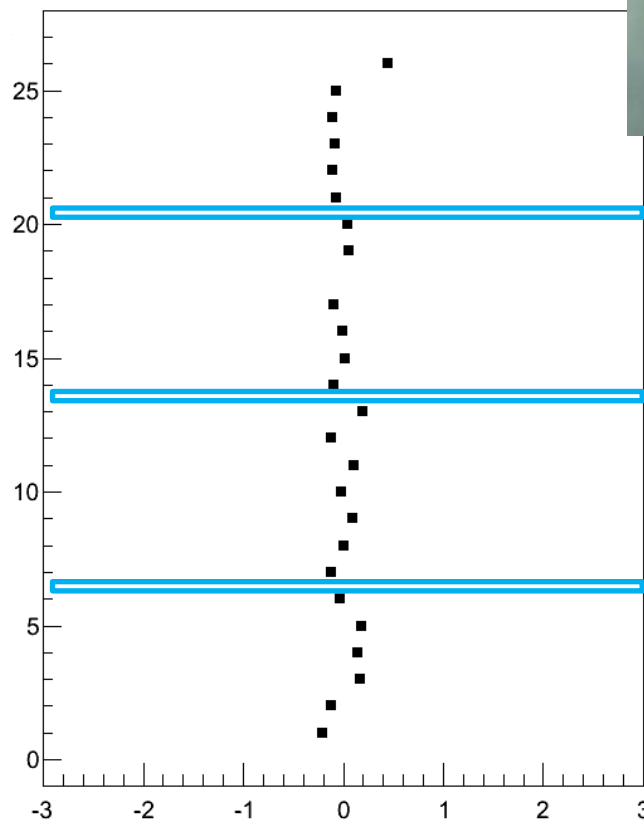
new GEM
 $\phi = 20^\circ$



pad row



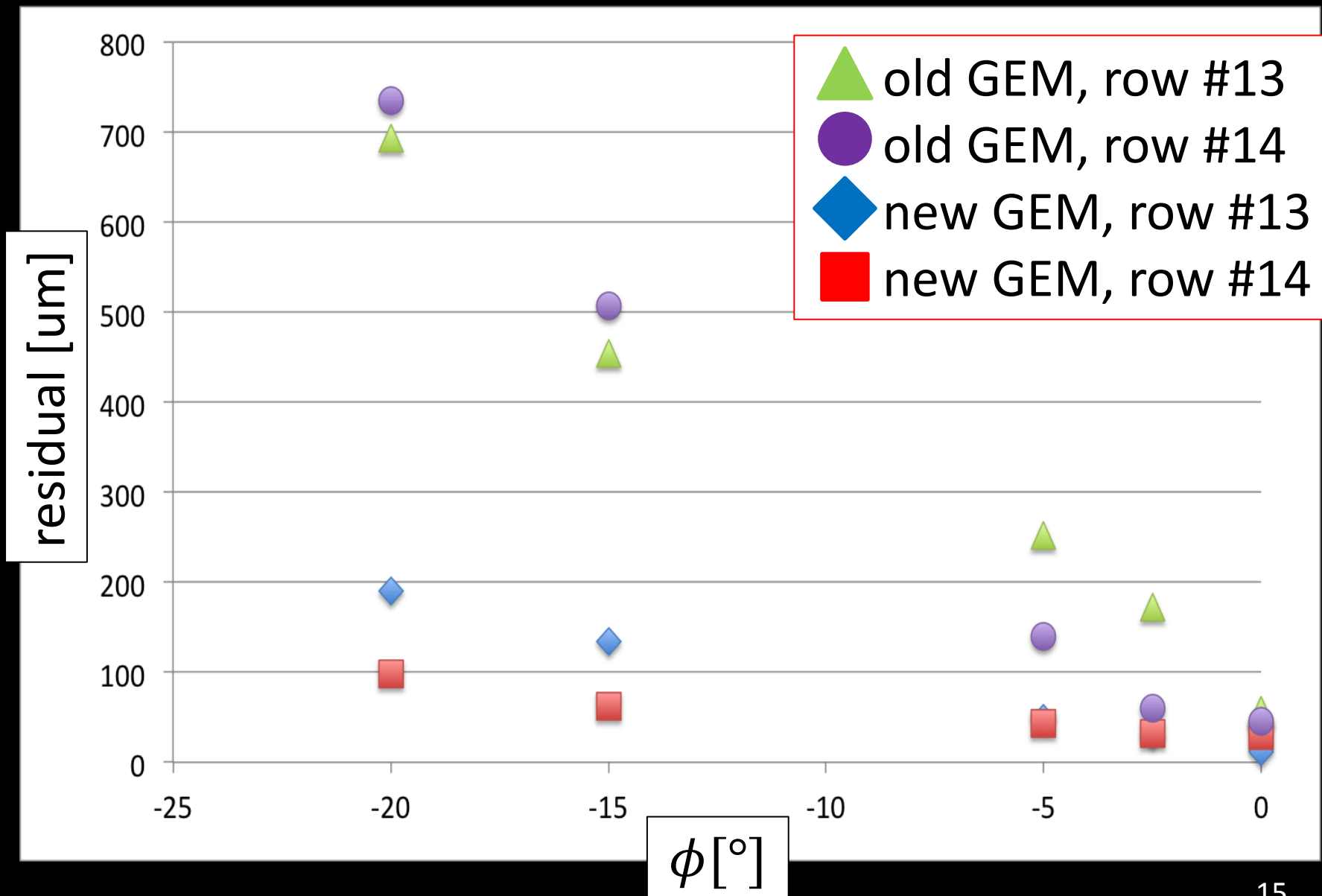
residual [mm]



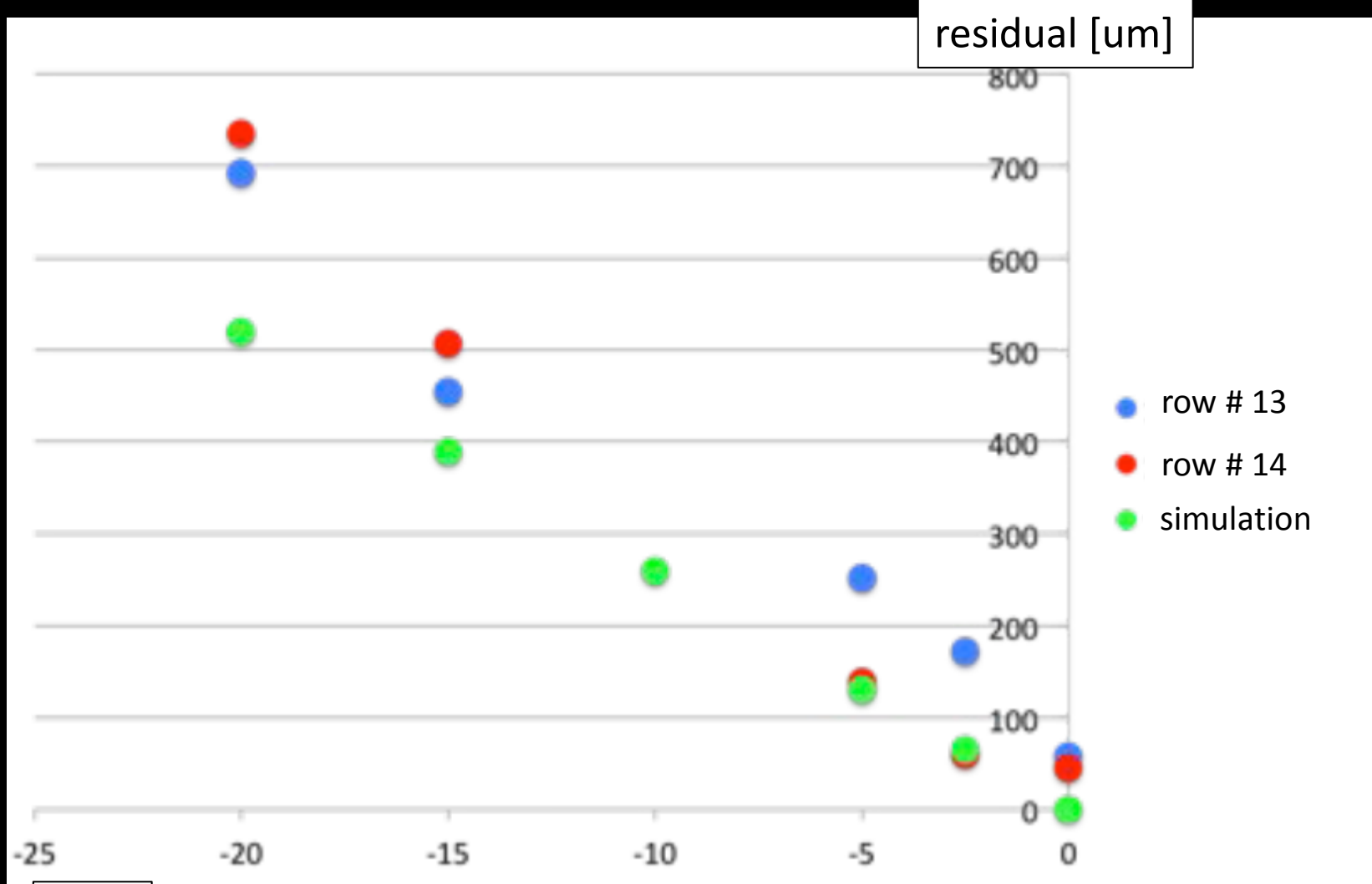
residual [mm]

color band:
gap region

Results



Comparison with Simulation (for old GEM only, by K. Zenkar)

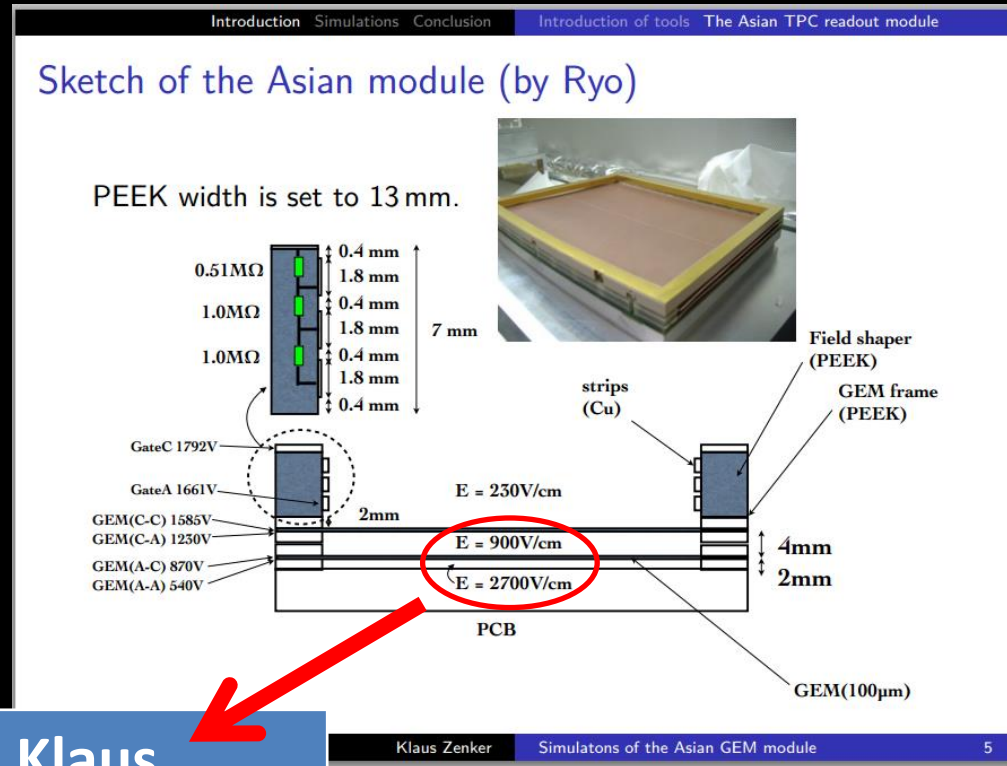
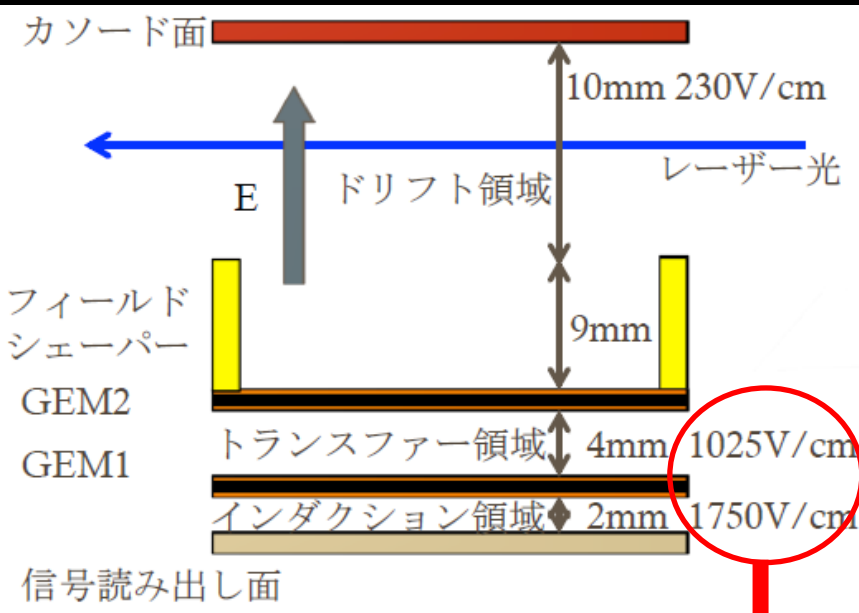


ϕ [°]

But...

Yatsukawa-kun's master thesis

Klaus Zenkar's work



electric field	Yatsukawa	Klaus
transfer	1025 V/cm	900 V/cm
induction	1750 V/cm	2700 V/cm

!?

Results

- The measured residual (distortion) with new GEM is much smaller ($\sim 1/4$) than old GEM.
 - need discussion that this measured value is enough small or not for ILC
- The tendency of angle dependency is same between simulation and measured data.
 - for old GEM only, we don't have any simulation results for new GEM
 - configuration between simulation and experiment is different (at transfer/induction region)

Summary

- We developed a laser facility for measuring distortion of modules. This facility is useful for evaluating distortion.
- **Measured distortion of new GEM is smaller than that of old GEM.**
- Tendency of angle dependence is same between simulation and measured data (for old GEM). **But the configuration between simulation and experiment is different.**

Plans

- Short term: measuring the distortion with wire gate
 - This work will start (reactivate) soon, **but at first we need to reactivate all systems in Fuji B4 as soon as possible. Otherwise we cannot take data.**
- Long term: cleaning up the neighboring space of our Fuji B4 experimental space, and construct a room for using laser facility
 - need a lot of discussion