

# **Status and Plan of Asian Module**

**We don't have real progress for a while  
same for this year**

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## COVID-19

Increase of infection case -> “emergency” state @Tokyo area

new variant of virus observed

“emergency” area may expand soon

All area exceeds the max. new case/day

after new year break, class -> remote again  
coming entrance exam.

We did not have face-face meeting @2020 at all  
activity is confined in each institute

We are heading to IDT/Pre-Lab. era.

2022-2025	Pre-Lab.	Lol	and/or	TP/TDR
2026-	ILC Lab.			

## What we should do until Lol/TDR

competition to other tech.

TPC is better tracker than Si tracker ?

we believe gaseous tracker with continuous track info.

do better performance ( Pt coverage, non IP track)

But no clear evidence

competition of various technique in the group

GEM/MM/Pixel

depend on schedule of technology choice

GEM:	variety of module design(?) amp. is indep. on RO system	choice of GEM/ #stack support str.
MM:	simple structure registive anode	design is unique except for RAnode
Pixel:	no ADC technically advanced	assembly

competition of GEM group/co

GEM DESY Asia

# Status of Japanese group

## hardware R&D

improvement of GEM stability

simulation study by Yumino( talk later )

try to find optimal condition of GEM str. hole size/thickness

proof by exp.

possibility of glass GEM

thickness measurement system@KEK

corelation btw. gain/stability and thickness

Ceramic GEM study (by Kindai & Iwate univ.)

## Analysis of Beam test result

though some behavior are still not explained well

( diffusion constant are not stable in each pad row )

but we should make paper for Gate performance under Beam(Yumi)

A study of two track separation is on going by (Aiko)

using two event overlaid beam data at raw data level

# Thickness measurement system @KEK

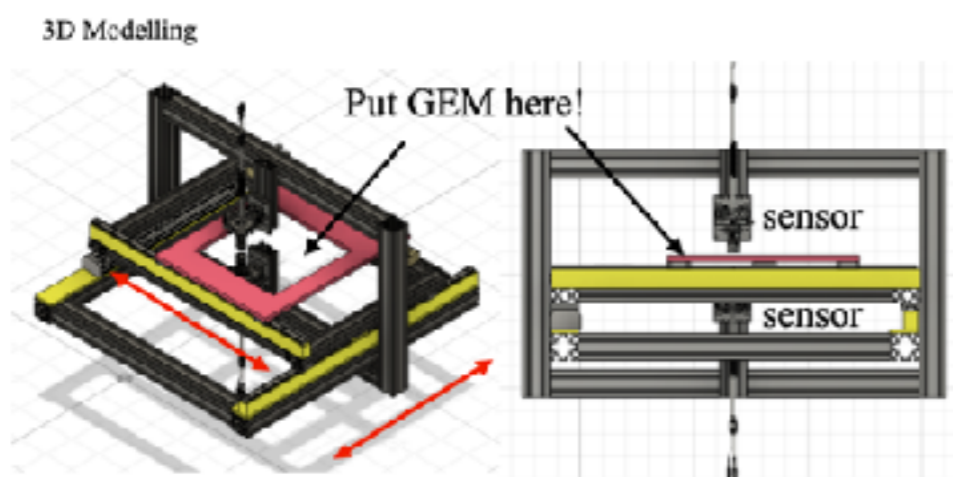
# Ceramic GEM study @ Iwate univ.

## Ceramic GEM

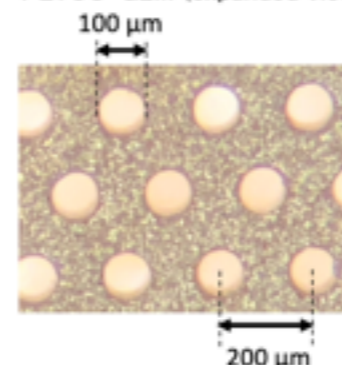
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We used the LTCC-GEMs produced by Hirai Seimitsu Kogyo Corporation.

### Thickness measurement system



### ▼LTCC-GEM (expanded view)



- No plating

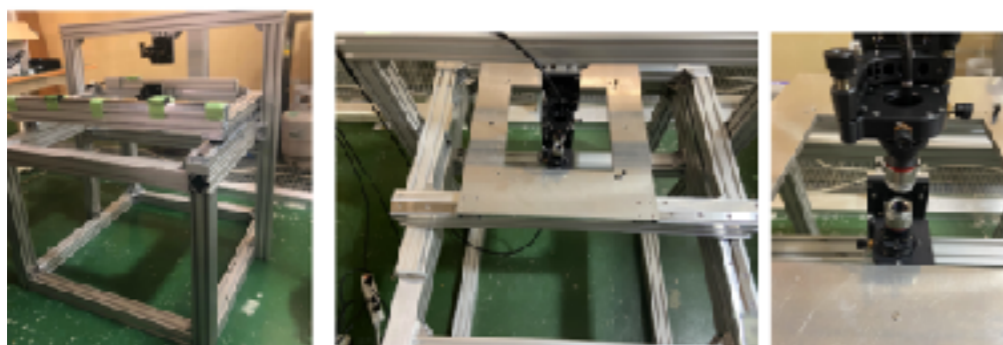
### ▼Parameter of LTCC-GEM

Effective area	100 mm × 100 mm
Hole diameter	100 μm
Hole pitch	200 μm
Thickness	200 μm
Insulator	LTCC (from supplier A, B*)
Electrode	Au

\*We have 2-GEMs which differ in the supplier of alumina material, but both GEMs are almost the same material except that the variation in particle size is slightly different.

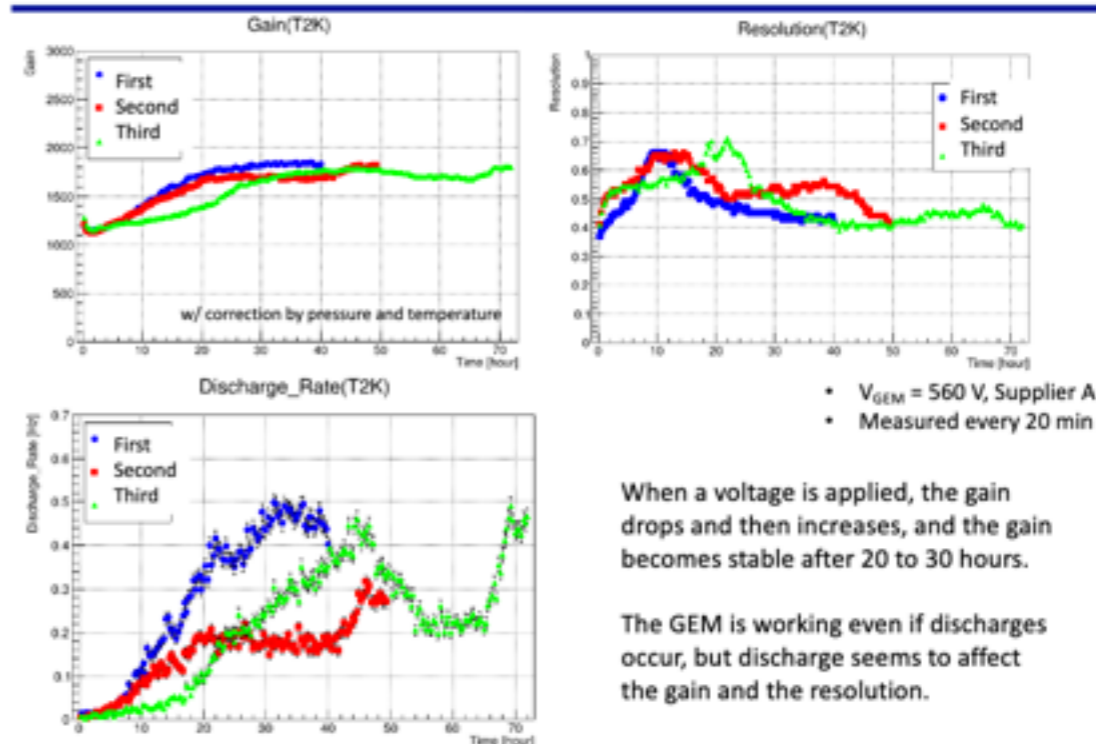
### Our plan

- Done! 🛠️ 1. 3D modelling of the measurement system
- Done! 🛠️ 2. Setup (Assembly, Sensor calibration)



## Long time measurement with T2K gas ~72h

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# Status of Japanese group

current R&D issues are basic element study only

Not easily connect to module design update

What was our basic concept

double GEM is simpler than triple stack  
single GEM is more simple

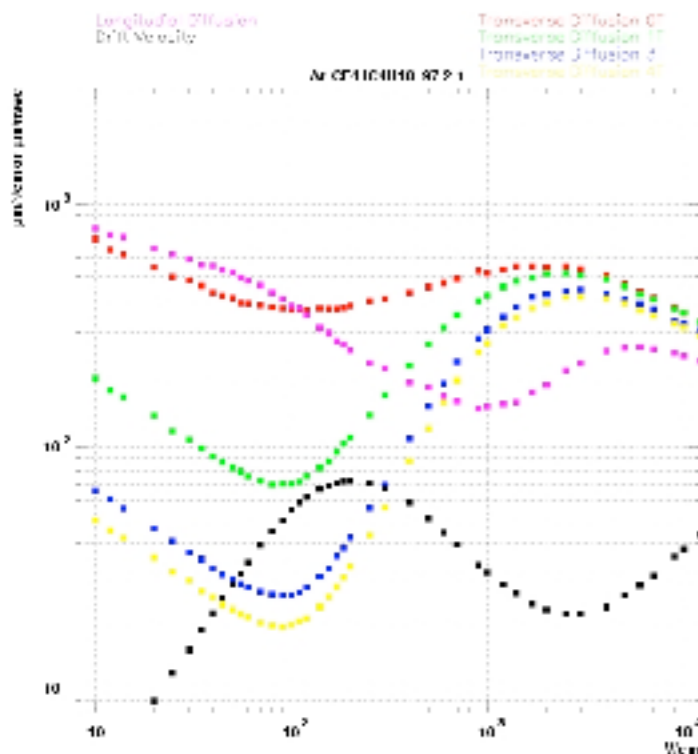
Alice choose 4 stack GEM system  
# of stack is not a problem

Neff is OK?  
diff.

Amplification region

spreading amp. electrons by diffusion (~300um@1mm pad)

needs ~1cm total gap (Cd~400um @2kV/cm)  
( extra gap for Gate (5 > mm) )



Do we stick these issues ?

gas Amplification system is not only issue to be studied

Gate

gas Amplification system

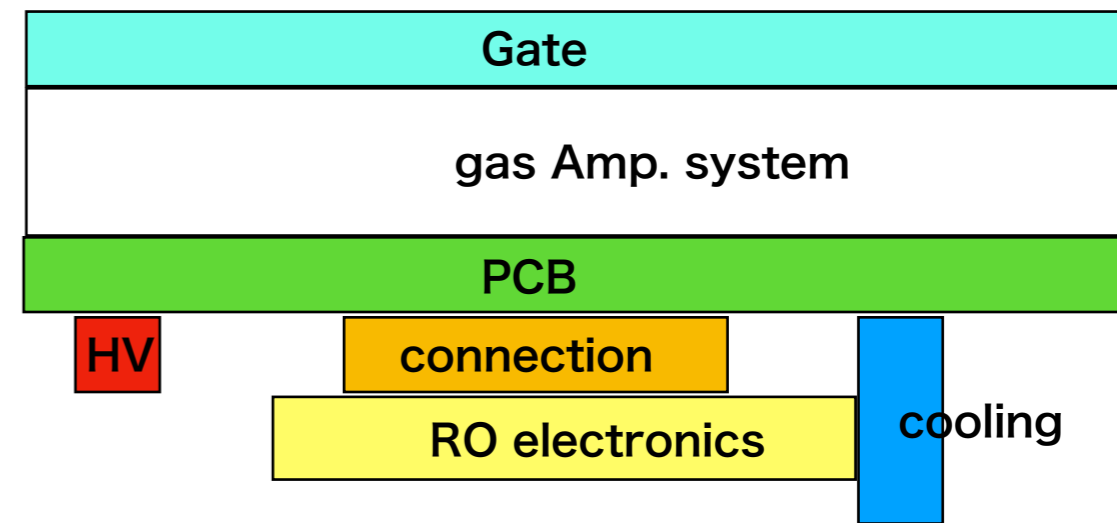
PadPlane PCB

Amp./Gate mount support  
pad plane / routing  
connection to RO electronics  
HV supply/connector  
cooling

RO electronics

inter module issue

boundary effect : uniformity of drift E  
extra shaping HV for module



Gas system  
HHV  
Field cage  
LV  
monitor  
.....

gas An universal Gate system is not only issue to be studied  
fit to GEM/MM/Pixel

Gate

gas Amplification system

PadPlane PCB

Amp./Gate mount support  
pad plane / routing  
connection to RO electronics  
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cooling

Gate is supported by PCB or amp. system ?  
HV supply to amp./Gate

PCB design /routing  
no real problem  
pad ptich/size stagger or not.

small pitch conn. or onics  
Saclay type wide pitch  
reinforced PCB

RO ele

cool RO electronics  
connector  
Pad plane  
inserted GND plane

#of HV channel  
GEMx2x#stack x#division  
+FS  
+2(Gate)  
connector?  
extension

inter module issue

boundary effect : uniformity of drift E  
extra shaping HV for module

Gas system  
HHV  
Field cage  
LV  
monitor  
.....



**We cannot study all of issues**

**manpower is limited**

**budget is also limited for a while**

**We need to choose R&D item**

**discussion will be held next week among Japanese group**

**prioritize R&D issues**

**schedule**

**“discussion session”@19th would help our discussion**

# **summary**

**R&D and analysis are going slowly**

**we may need some boost to accelerate studies**

**real summary would be provided after our meeting**