Oct. 24, 2016

Toward the final design of a TPC for the ILD detector D_RD_9

Serguei and Keisuke

Conclusions

- **The French-Japan R&D work within the LCTPC collaboration is in a phase of engineering toward the final design of a TPC for the ILD detector**

- **It also allowed us to identify a few points requiring common active R&D to be pursued in the next few years**
  - ion backflow and gating
  - field distorsions at module boundaries
  - GEM and MM modules with common electronics
  - effect of the resistive foil

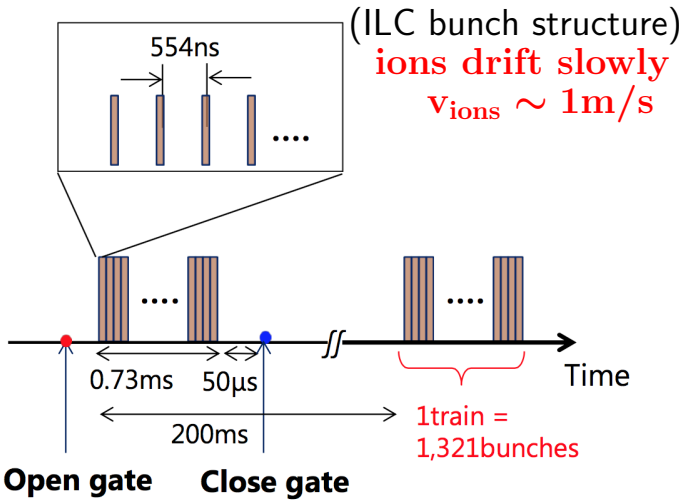
- **Special thanks to P. Colas, T. Matsuda, and A. Sugiyama**

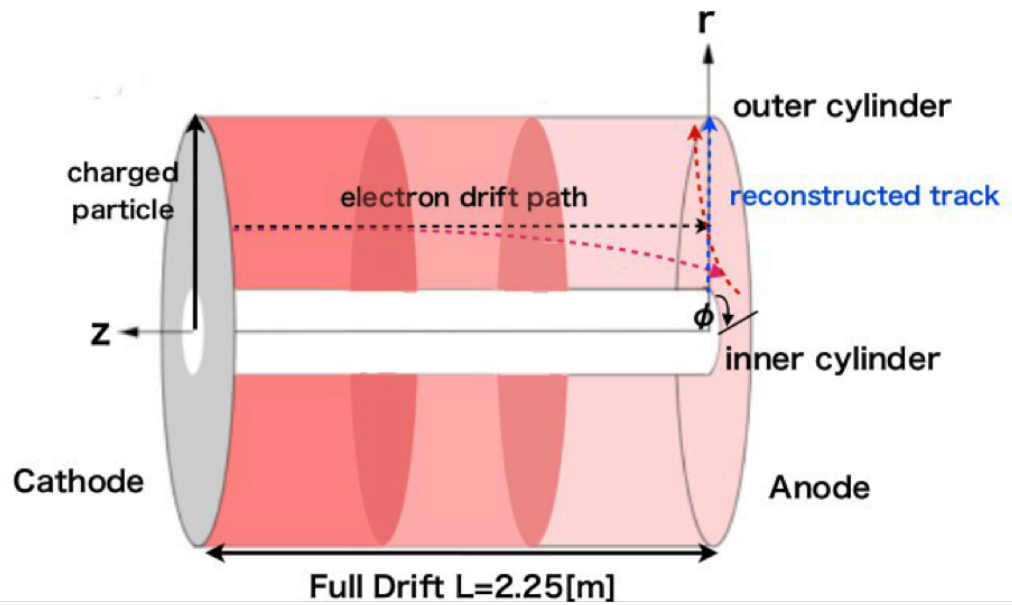
Ion Gate

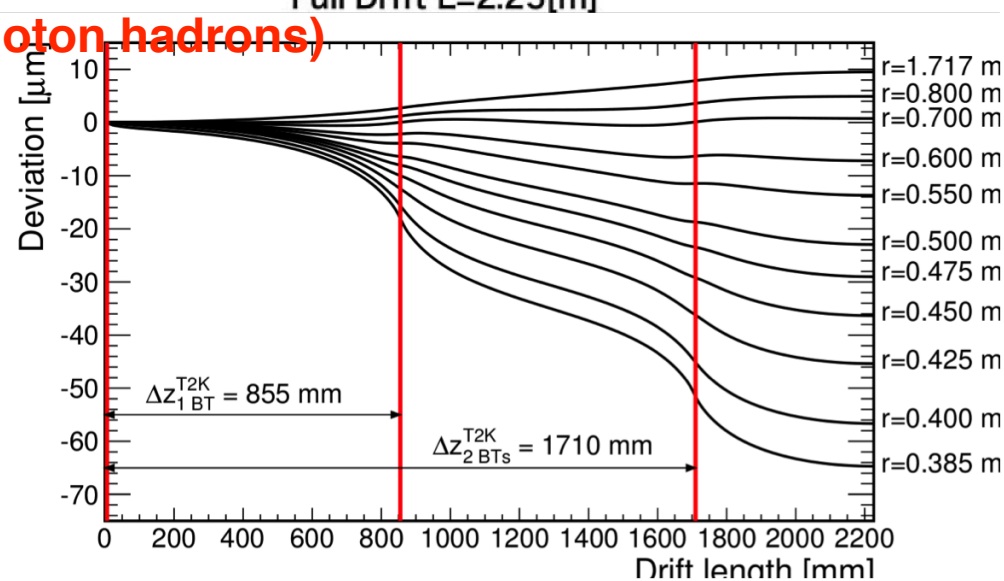
Ion Backflow

Ion Space Charge can deteriorate the position resolution of TPC

- **Primary ions** yield distortions in the E-field which result to $O(\leq 1\mu m)$ track distortions
- **Secondary ions** yield distortions from backflowing ions generated in the gas-amplification region:
  - 60 μm for **IBFxGain=~~1~~ 3 (no 2-photon hadrons)** for the case of 2 ion disks

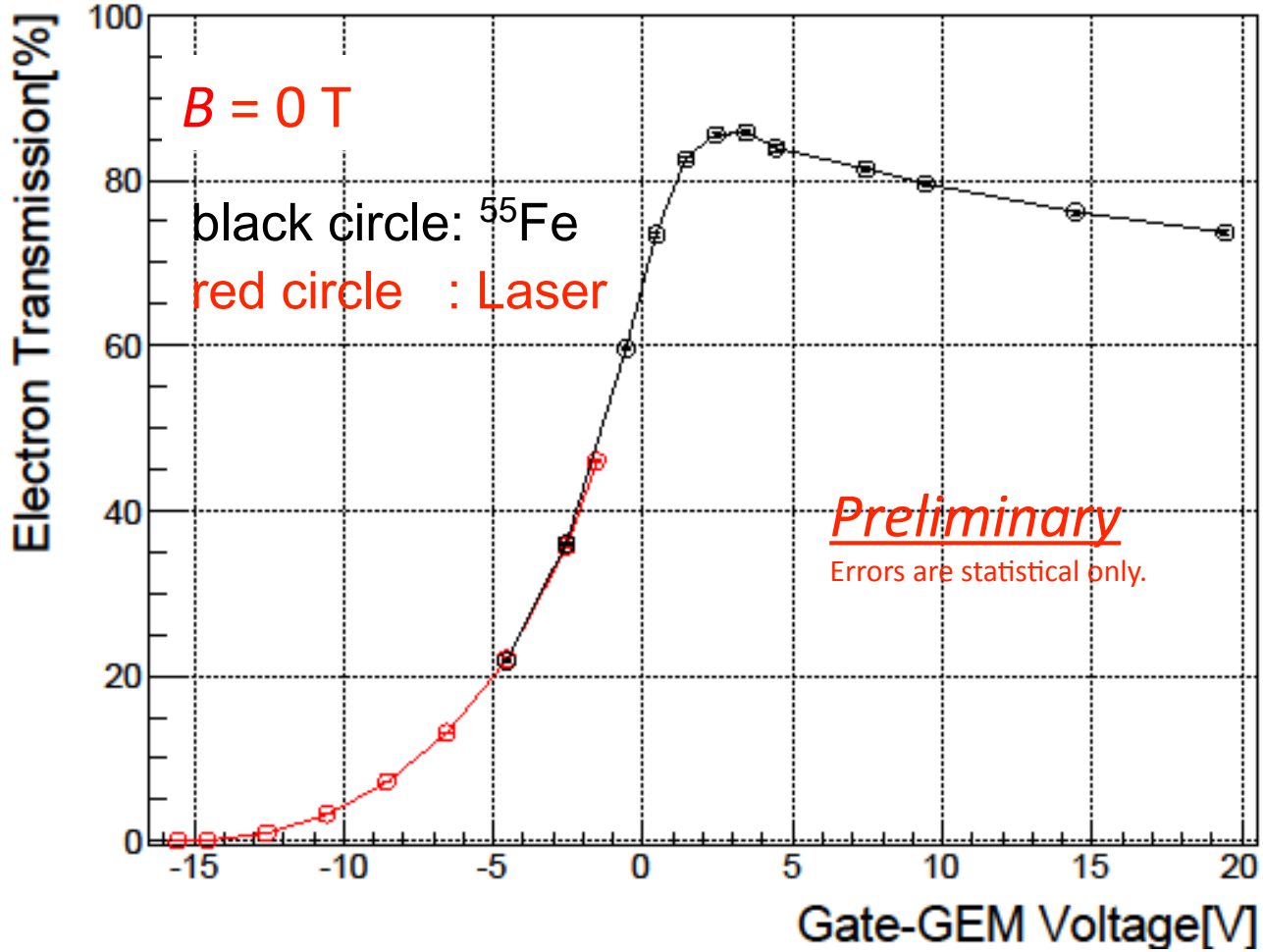






Gate is needed!

Recent Measurement of Electron Transmission Rate



More by Aiko Shoji

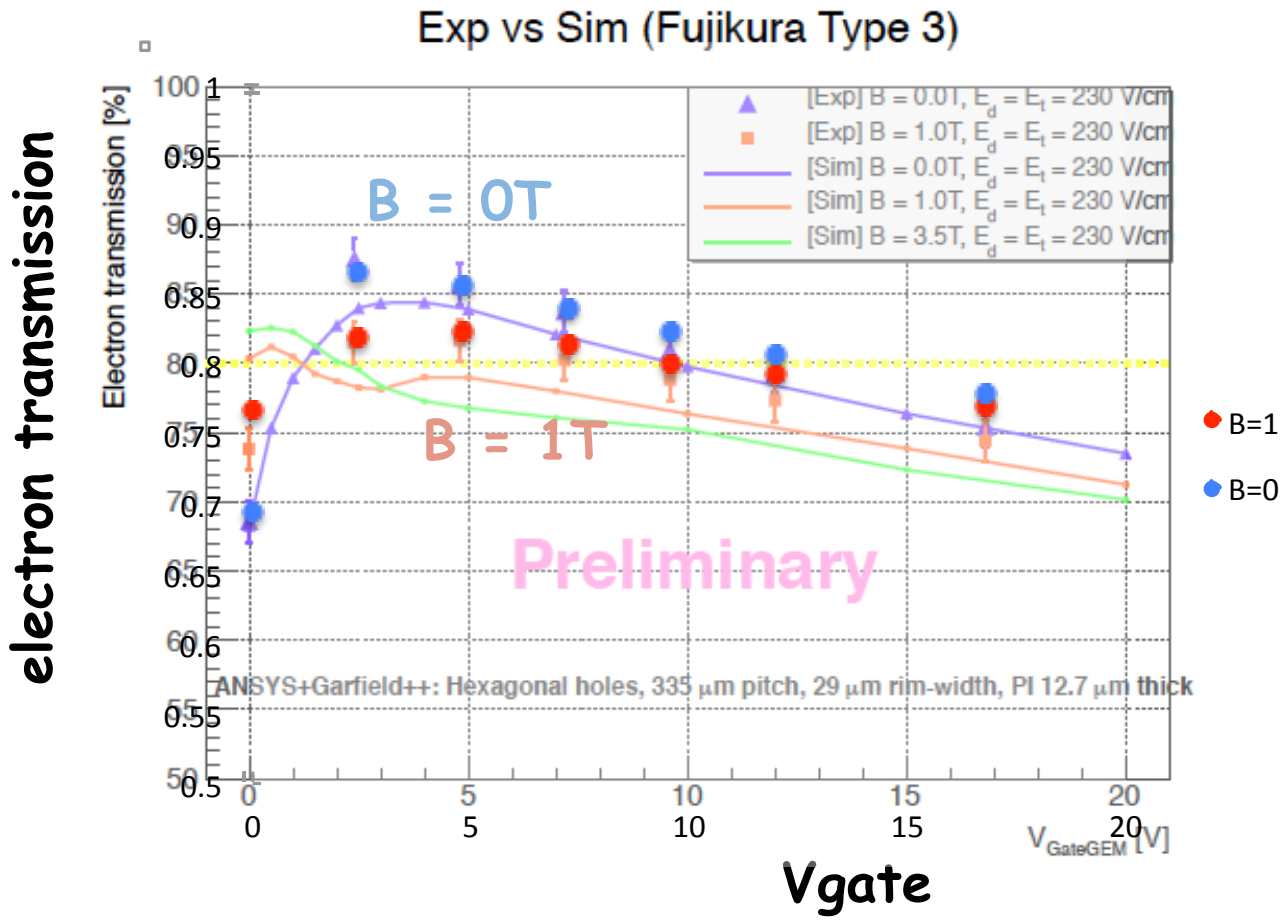
Electron transmission

Akira Sugiyama 2016/09/29

10cmx10cm prototype(type 3) provides more than 80% transmission even for B = 1T field

Simultaneous fit
difference is slight

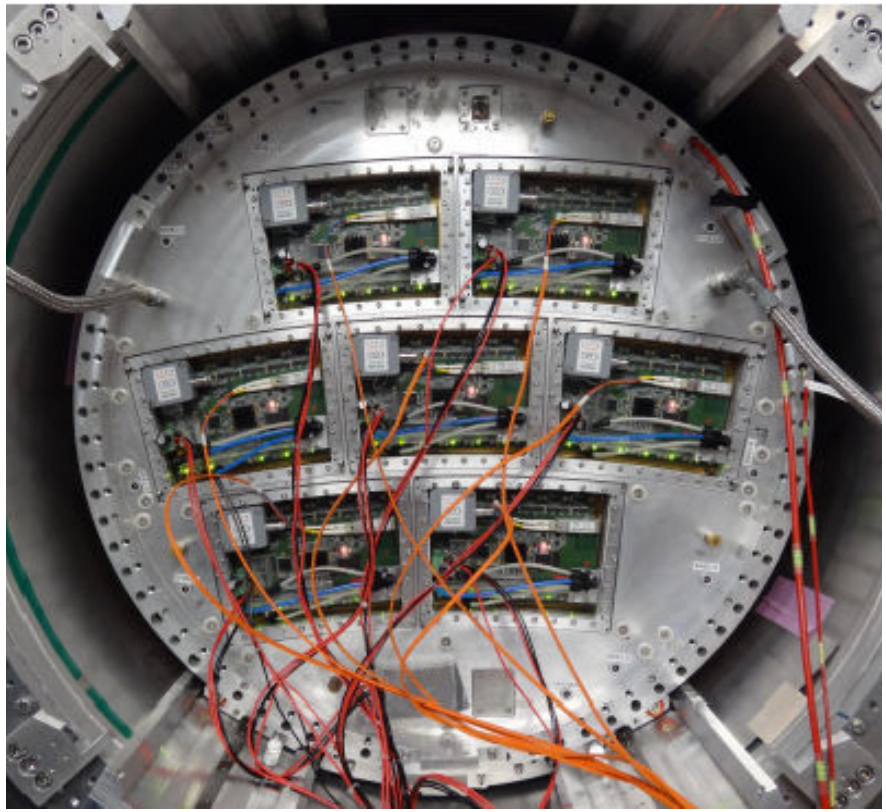
Though minor diff. btw data and MC at B=1T
still exist



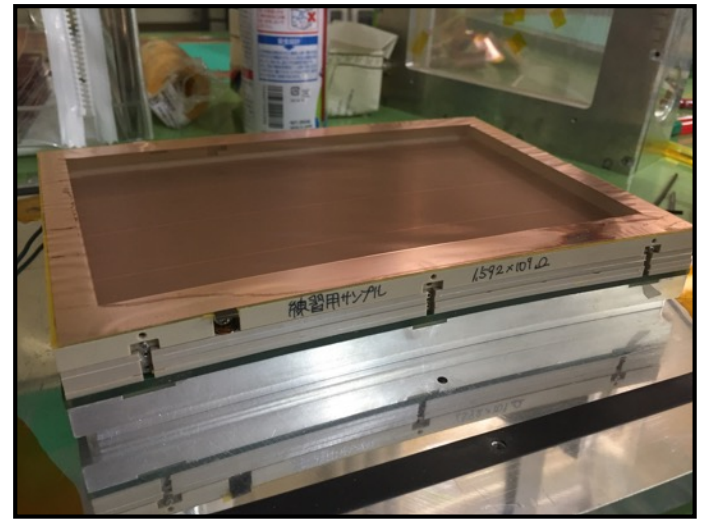
MC assume simple straight hole
but real gate has taper

2016 Beam Test: the Plan.

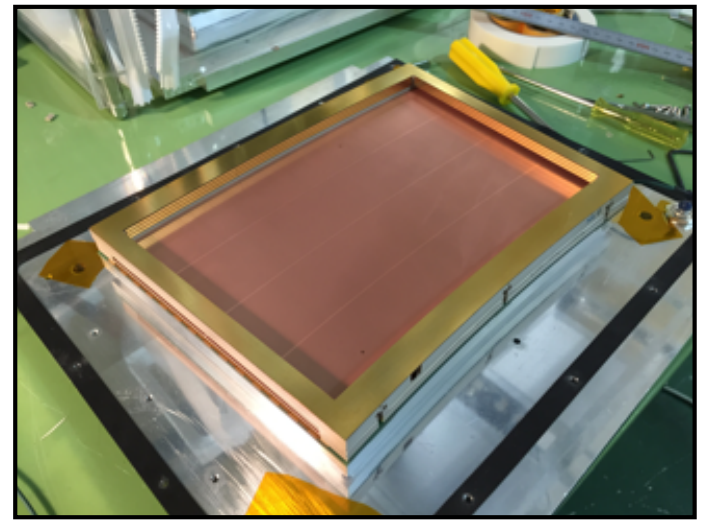
- **2 modules will be installed in the LP1 module.**
  - one is the module equipped with the gating GEM.
  - another one is equipped with the field shaper.



- **the module w/ the gating GEM.**



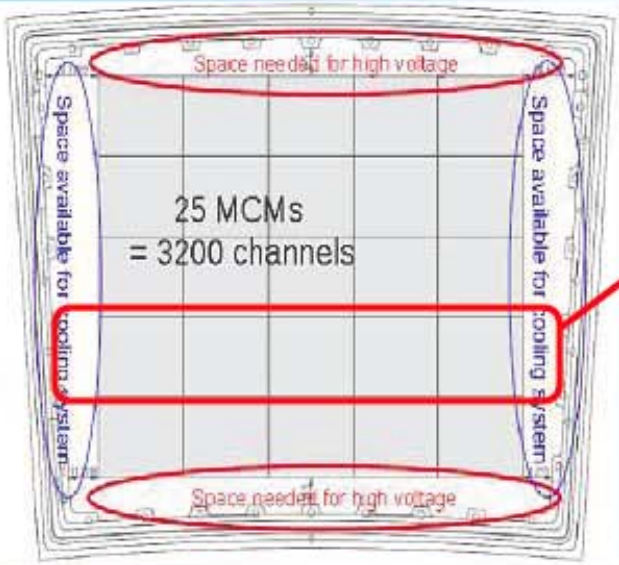
- **the module w/ the field shaper.**

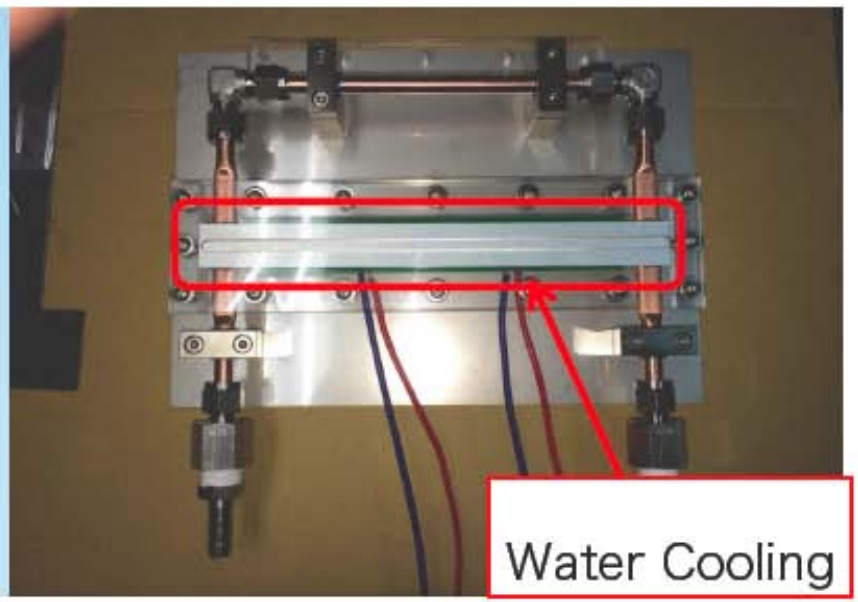


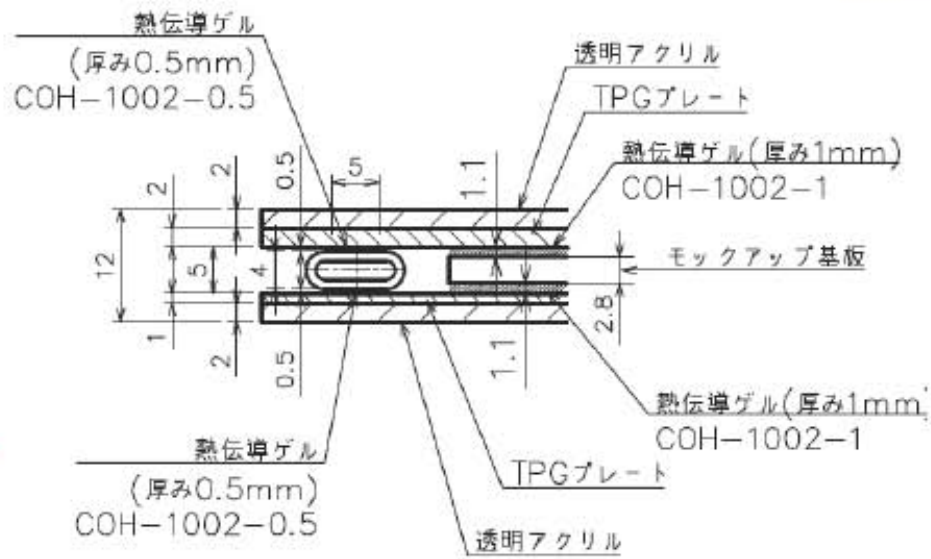
- **Measurement will be performed under the magnetic filed (0/1T) using 5GeV/c electrons.**
- **Scan a position along Z direction from 25 [mm] to 550 [mm]**
- Unfortunately, this group dose't have a night shift!

2P-CO2 Cooling

Mockup test under water cooling setup



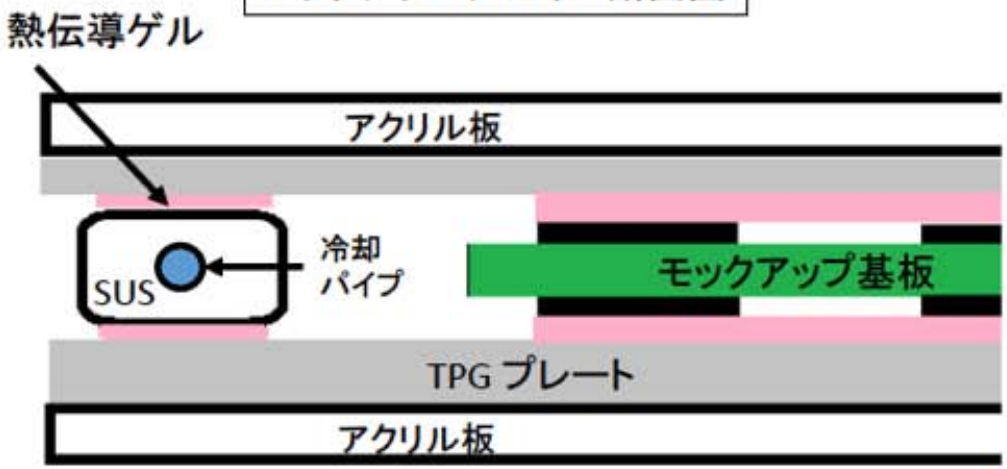




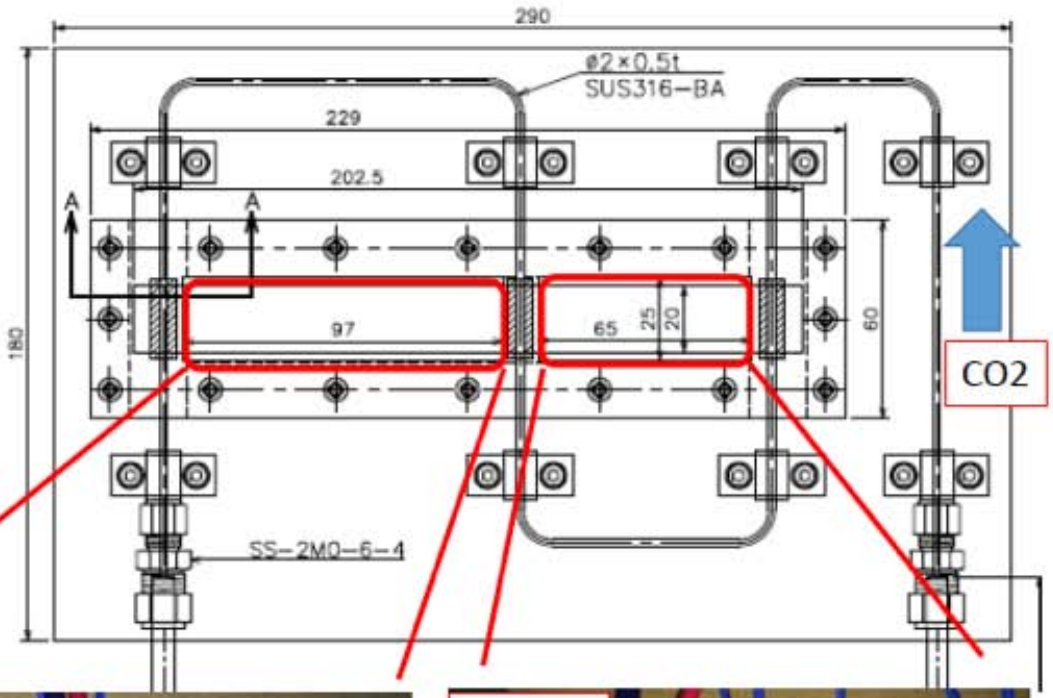
モックアップ冷却試験セットアップ

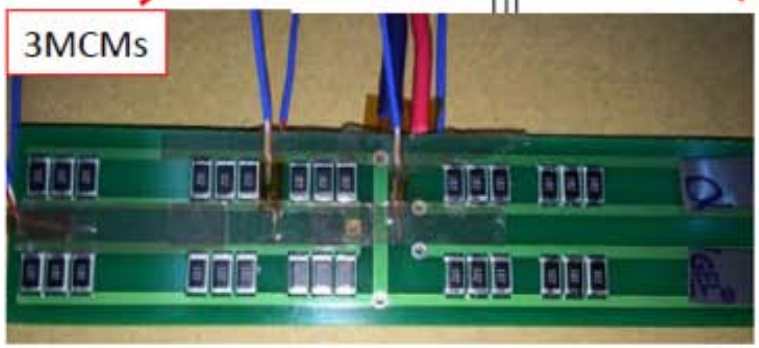
2相CO2冷却試験のためのモックアップデザイン

モックアップデバイス断面図



パイプ・SUSブロックとモックアップ基板を
熱伝導ゲルを介してTPGで挟み込んでいる

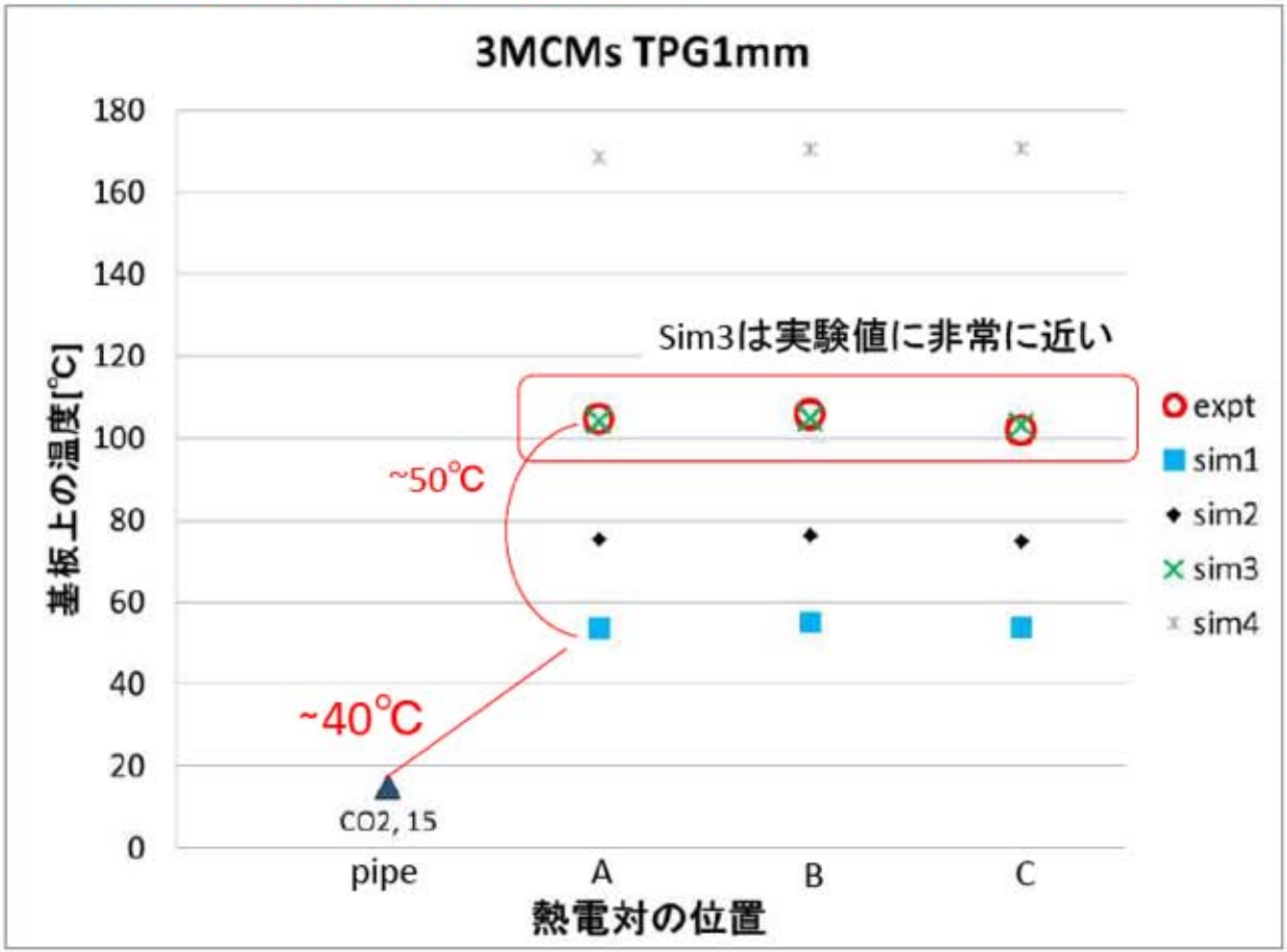




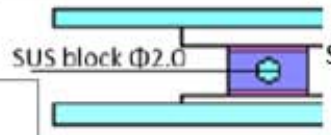
Toda @JPS2016

1. パイプとSUSブロックの接合がどれほど影響するか

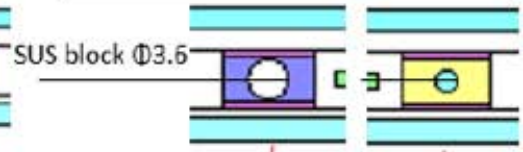
MCM 連続操作条件　3203mW



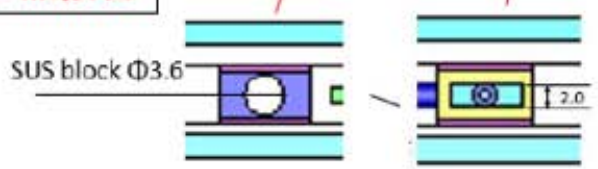
Sim1.完全な接触



Sim2.端面のみ完全接合

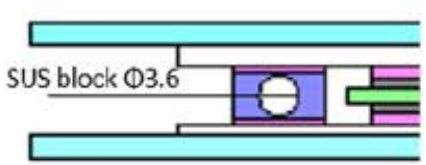


Sim3.
端面での点接合



→ 制作したモックアップデバイス
に最も近い状態

Sim4.接触なし（空冷のみ）



Obtained data using the mock up was bad

but we have learned

how to use CO2 cooling

SUS block is no good for heat connection
though cooling pipe is made of SUS
good welding is necessary

data was well reproduced by simulation
simulation study may work for this study. good point!!

TPG seems to be good(but too expensive) as material