Progress of TPC prototype integrated with UV laser beams

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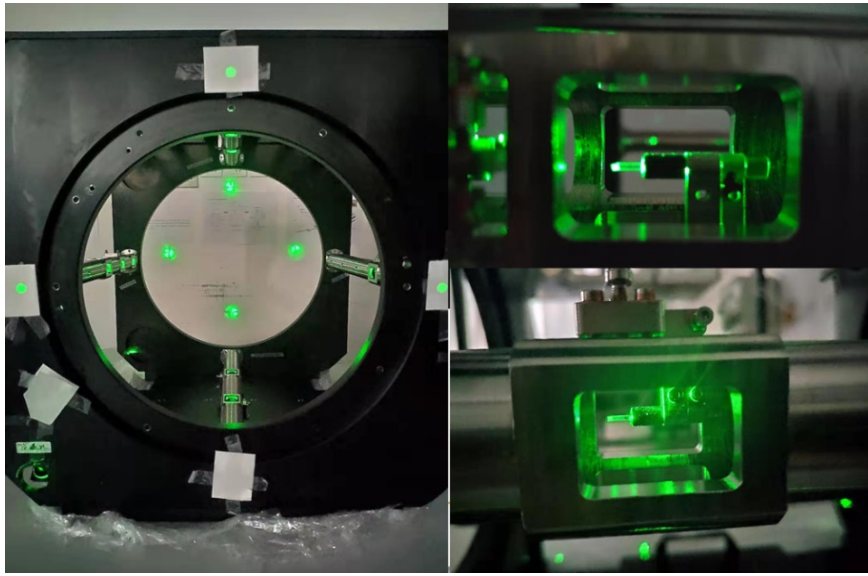
Oct., 29, 2020

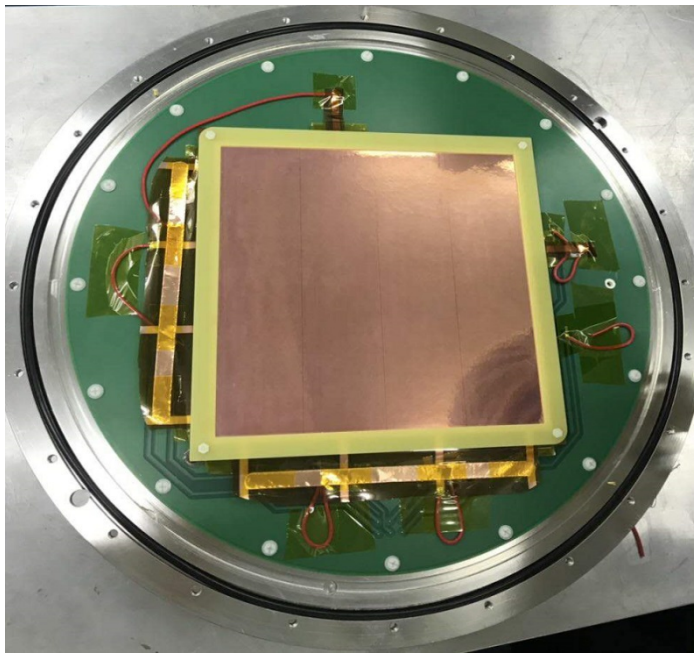
Outline

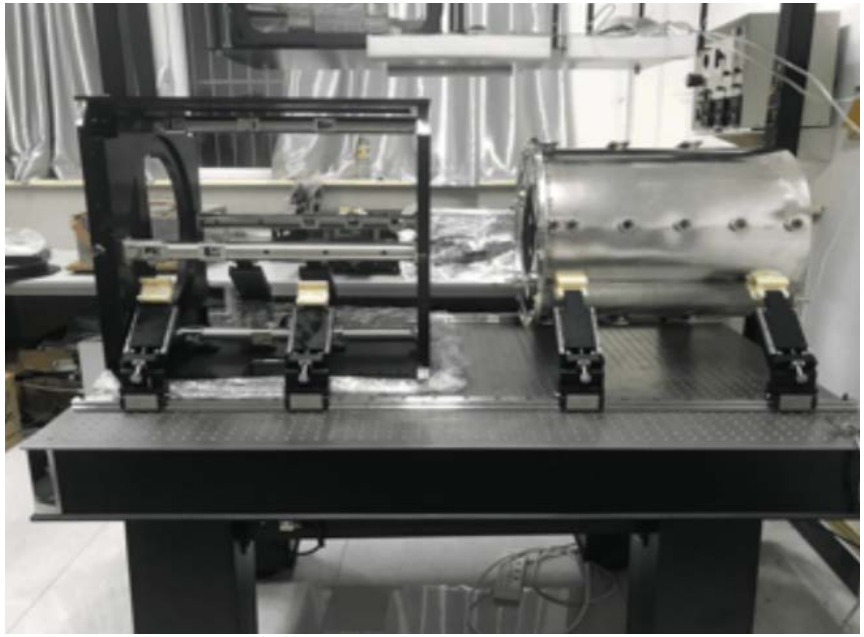
- TPC with UV laser beams
- Some test results

TPC detector prototype

- Study of TPC prototype with 42 UV laser beams
- Main parameters
  - Drift length: ~500mm, Active area: 200mm^2
  - Integrated 266nm laser beam
  - GEMs/Micromegas as the readout





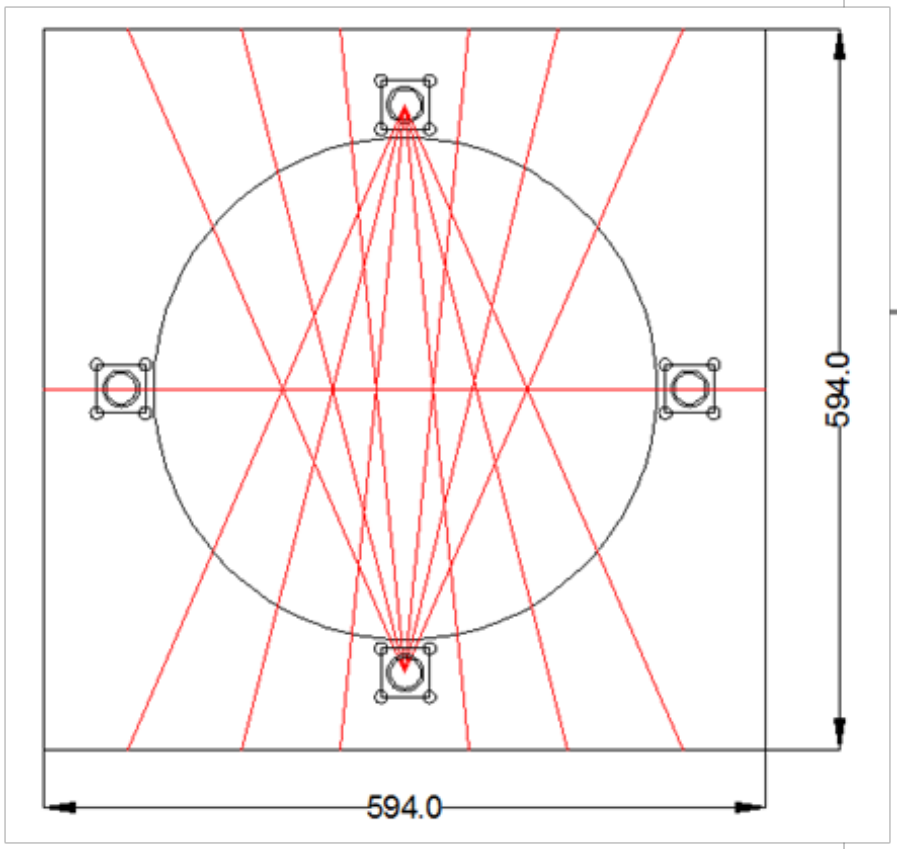


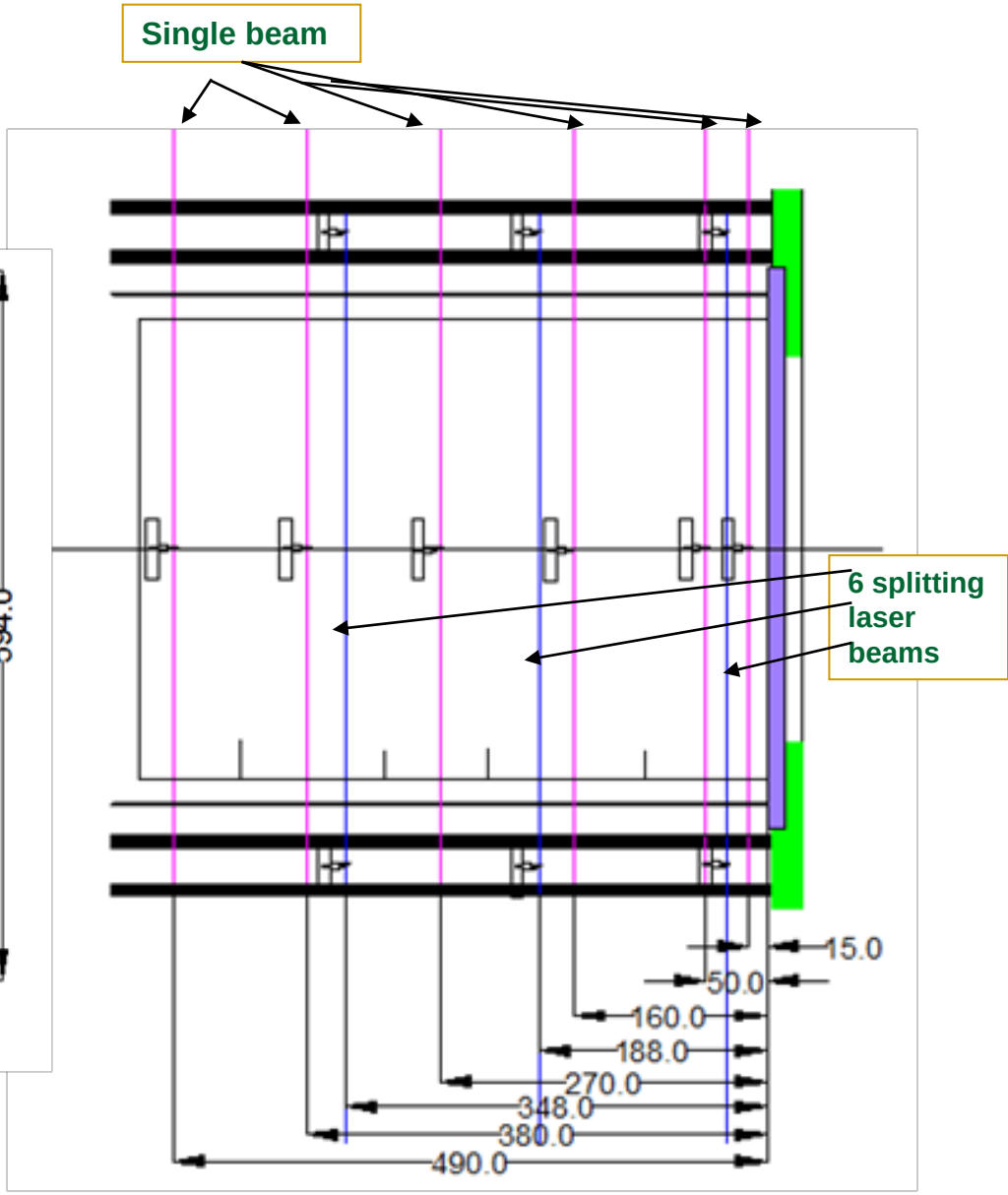
Electronics and DAQ

- Amplifier and FEE
  - CASAGEM chip
  - 16Chs/chip
  - 4chips/Board
  - Gain: 20mV/fC
  - Shape time: 20ns
- DAQ
  - FPGA+ADC
  - 4 module/board
  - 64Chs/module
  - Sample: 40MHz
  - 1280chs

FEE Electronics and DAQ setup photos

Layout of UV beams

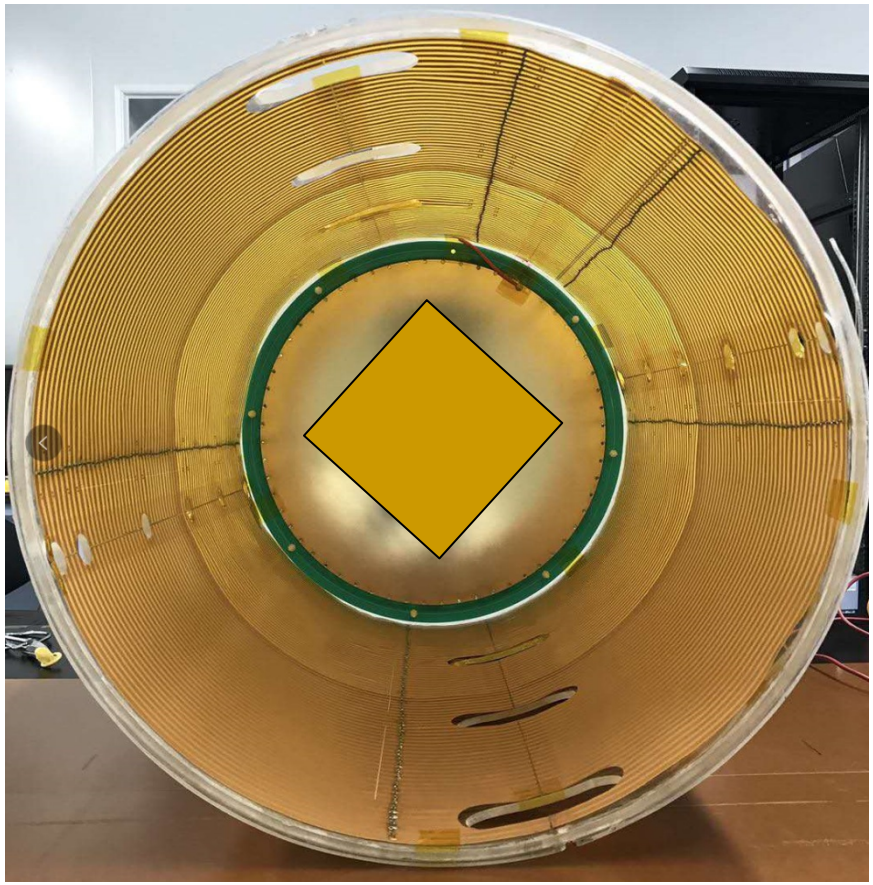




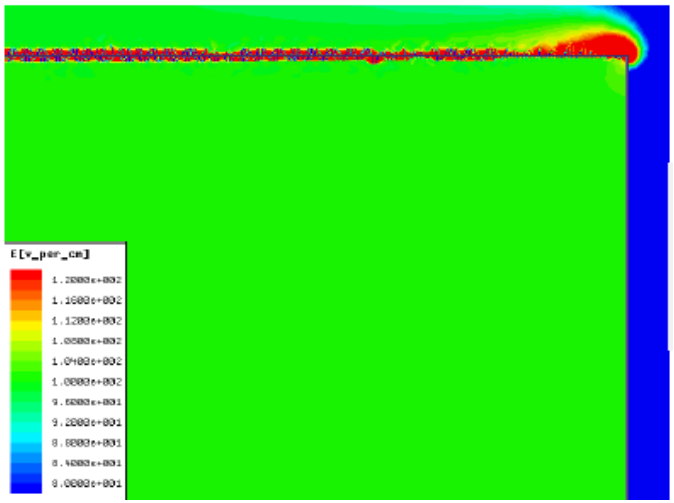
Laser map in X-Y direction

Laser map along drift length

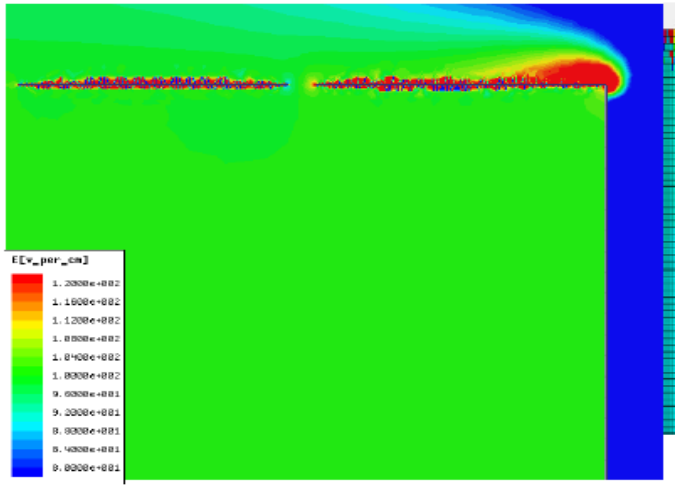
Fieldcage-1



Without hole along drift length



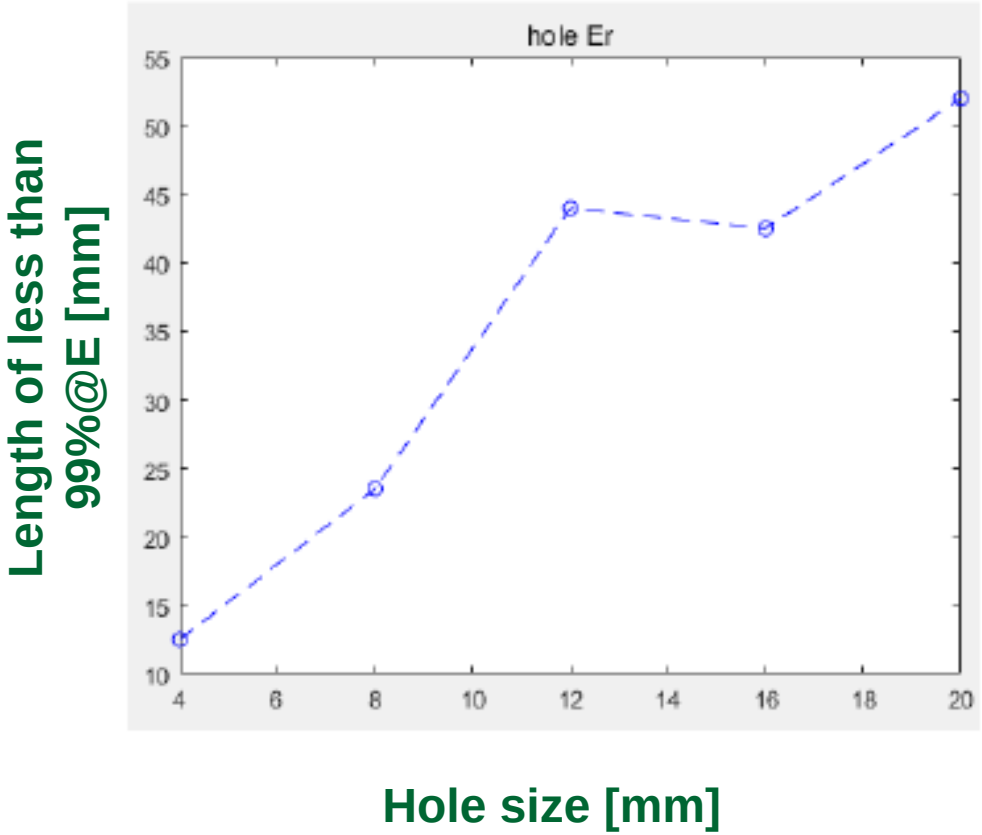
With Ø20mm hole along drift length



Simulation

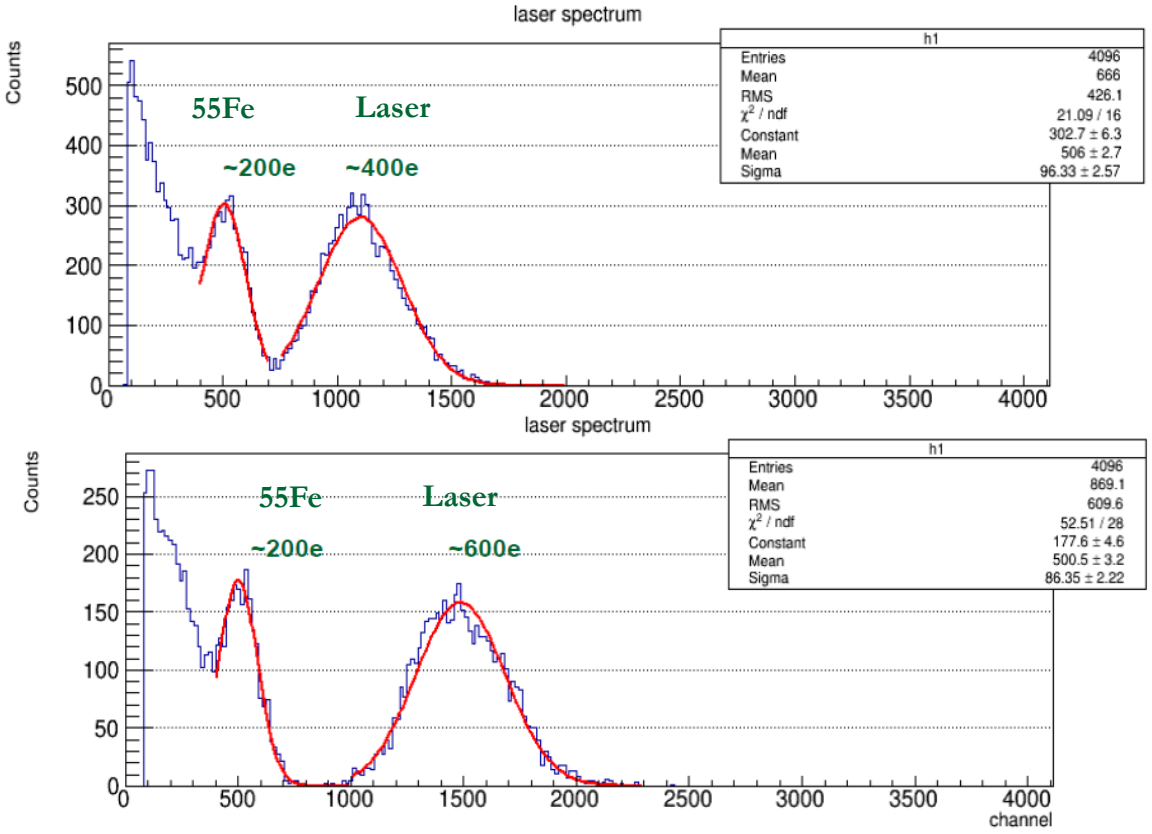
- Hole size VS length of less than 99% of electric field
- <12mm of hole size in this prototype along drift length

Fieldcage-2



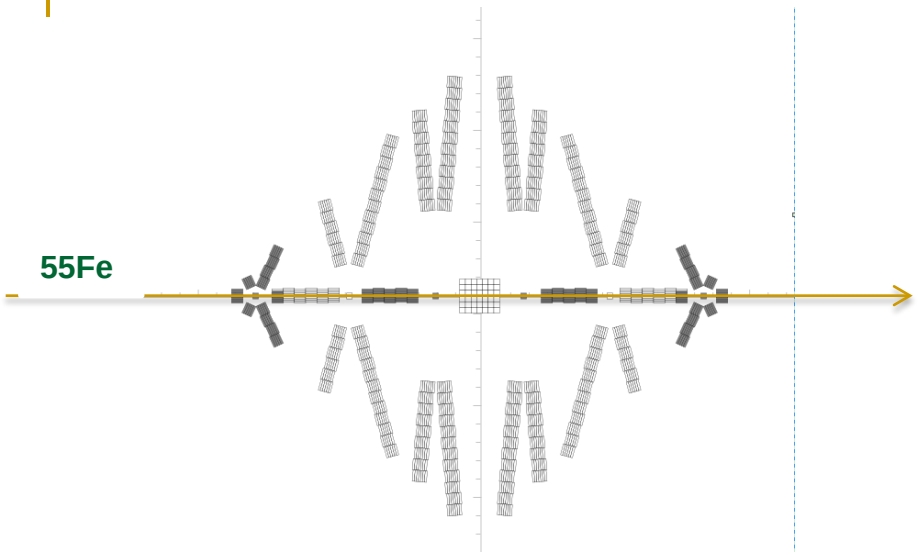
- Active area in middle: 200mm^2
- Accuracy of No magnetic resistance: 0.1%
- Electric field with/without hole along drift length
  - Simulation by ANSYS with/without hole
  - Uniformity of electric field: >99% in active area

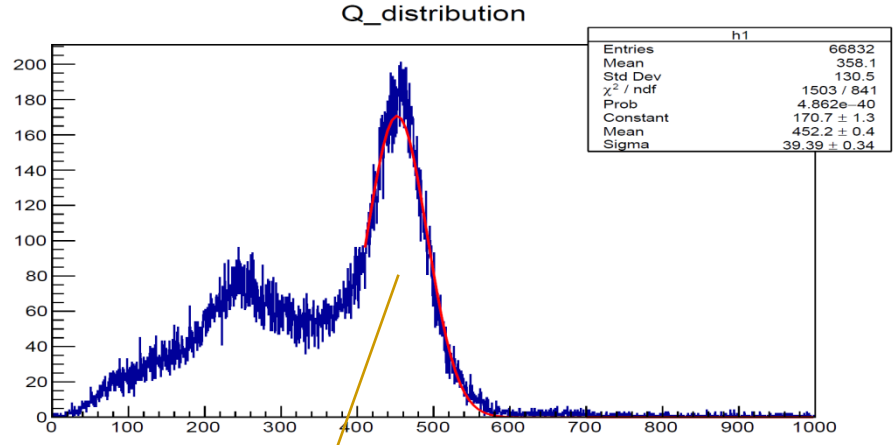
Comparison of UV laser and 55Fe



- Same of working gas@T2K, same of high voltage, same of test conditions
- Different of UV laser beam size @ Ø0.5mm and Ø0.5mm

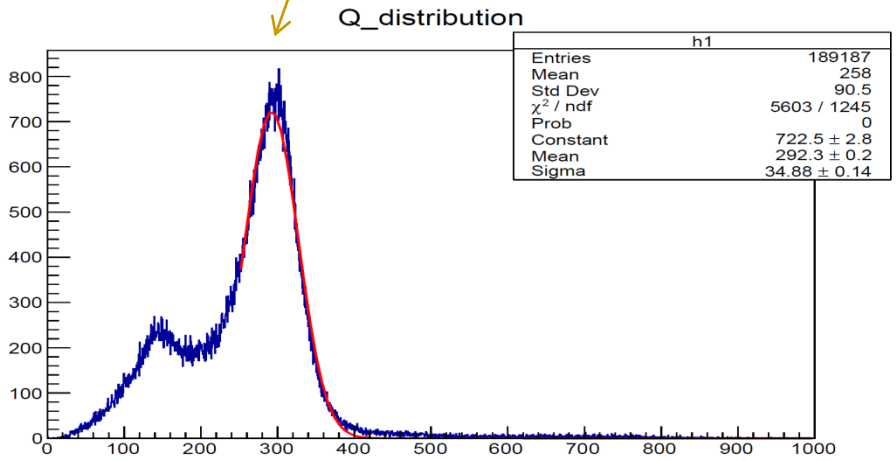
Triple GEMs to double GEMs @T2K gas





55Fe energy spectrum using Triple GEMs

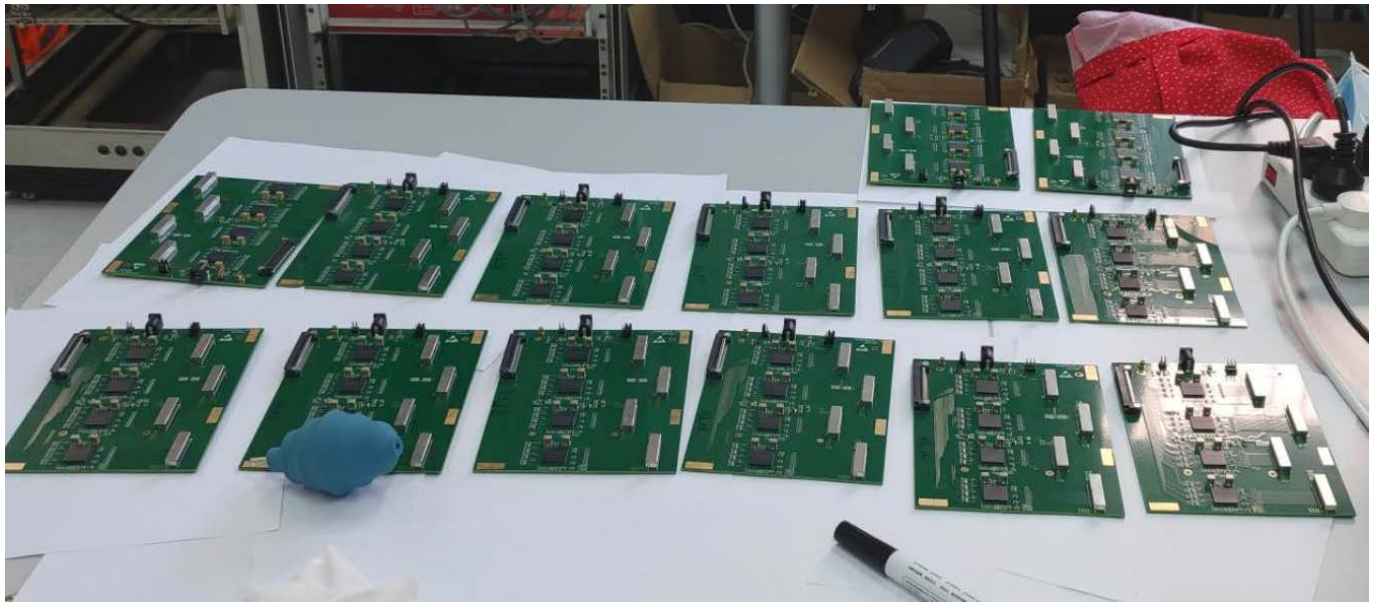
- Same of working gas@T2K, same of high voltage, same of test conditions
- Different of GEMs@ 320V
- Triple GEMs to double GEMs
- No discharge



55Fe energy spectrum using Double GEMs

One problem for testing

- There are some obvious noise from half of the readout channels in last three weeks testing.
- All chips need clean and re-test after our many tries and discussions with the colleagues of Tsinghua.
- We will remount all in next Monday.



Beam plan from IHEP

- There is a update plan to set one underground tunnel as a beam test station in BES (IHEP existing small circular collider).
- It will be as a 2.5GeV e- beam line for the detector testing.
- Many things should be prepared and mounted.

Thanks for your attention.