The basic experiment of new GEM module

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What Hiroshima-group have done at Fuji B4 in KEK?

- Gain measurement for old GEM (2012/Oct)
- Gain measurement for new GEM (2013/Sep)
- Stability measurement of gain and discharge for new GEM (2013/Sep)
- Taking data; laser power dependence of output ADC-value for new GEM (2013/Dec)

Information about gain and discharge experiment for new GEM

- Date: Sep/9th/2013~Sep/11th/2013(@KEK)
- H.V. configuration ↓ (for checking H.V. dependency of gain)

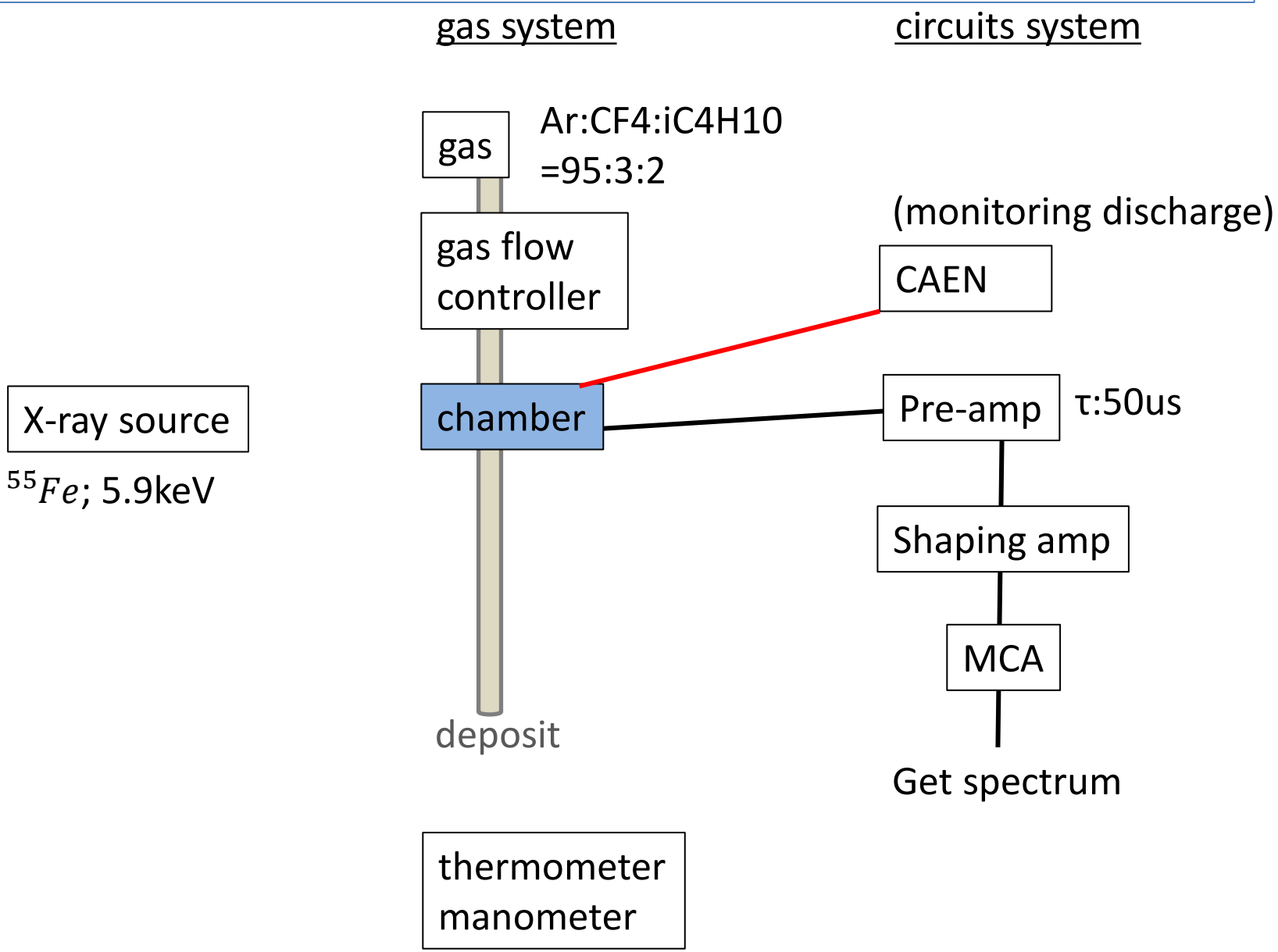
Va \ Vc	320V	325V	330V	335V	340V	345V	350V	355V
320V		O	O	O	O	O	O	O
325V	O	O	O	O	O	O	O	
330V	O	O	O	O				
335V	O	O	O					
340V	O							

O: we took data

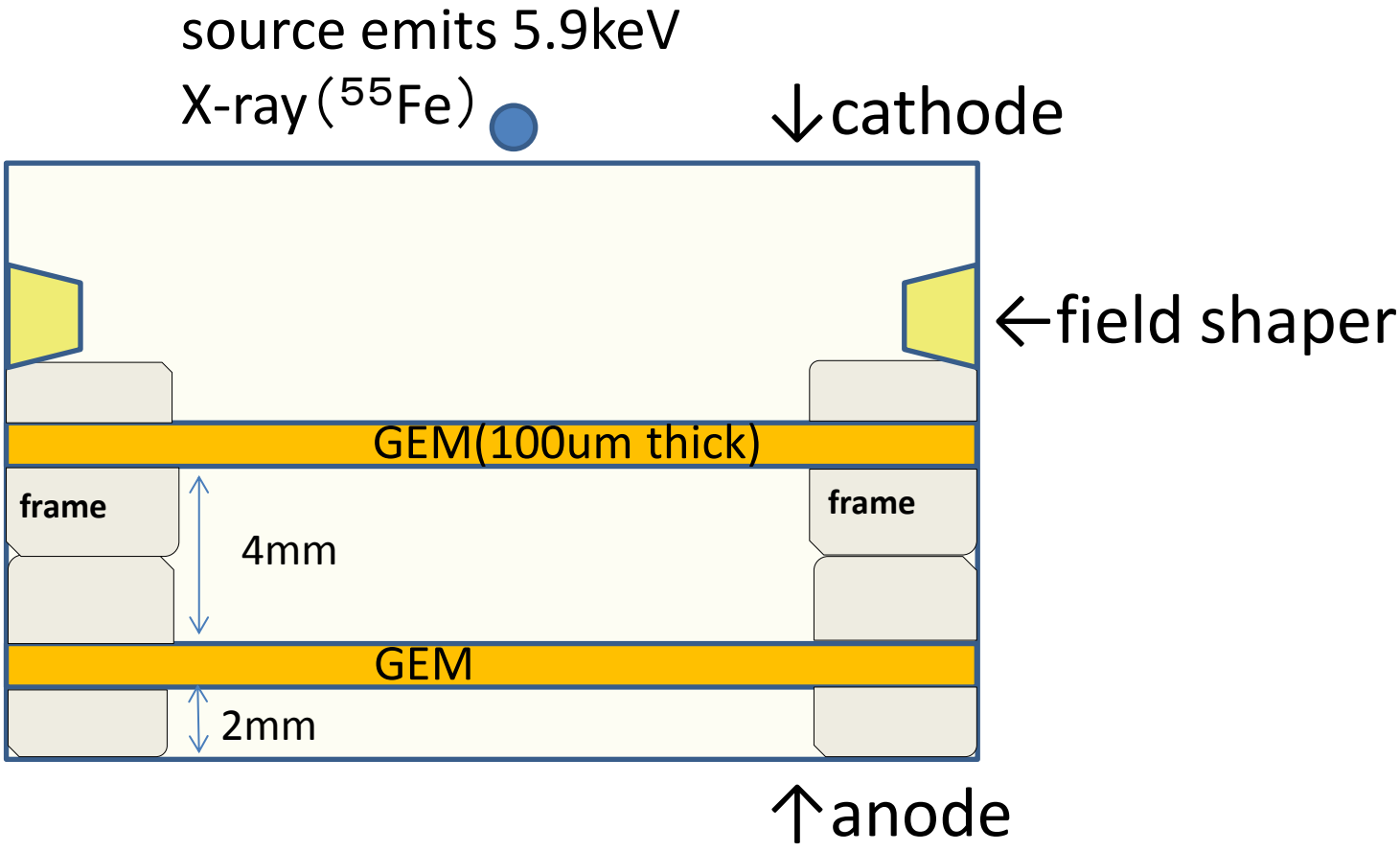
Va: voltage of anode-side GEM

Vc: voltage of cathode-side GEM

Set up (at Fuji B4F)

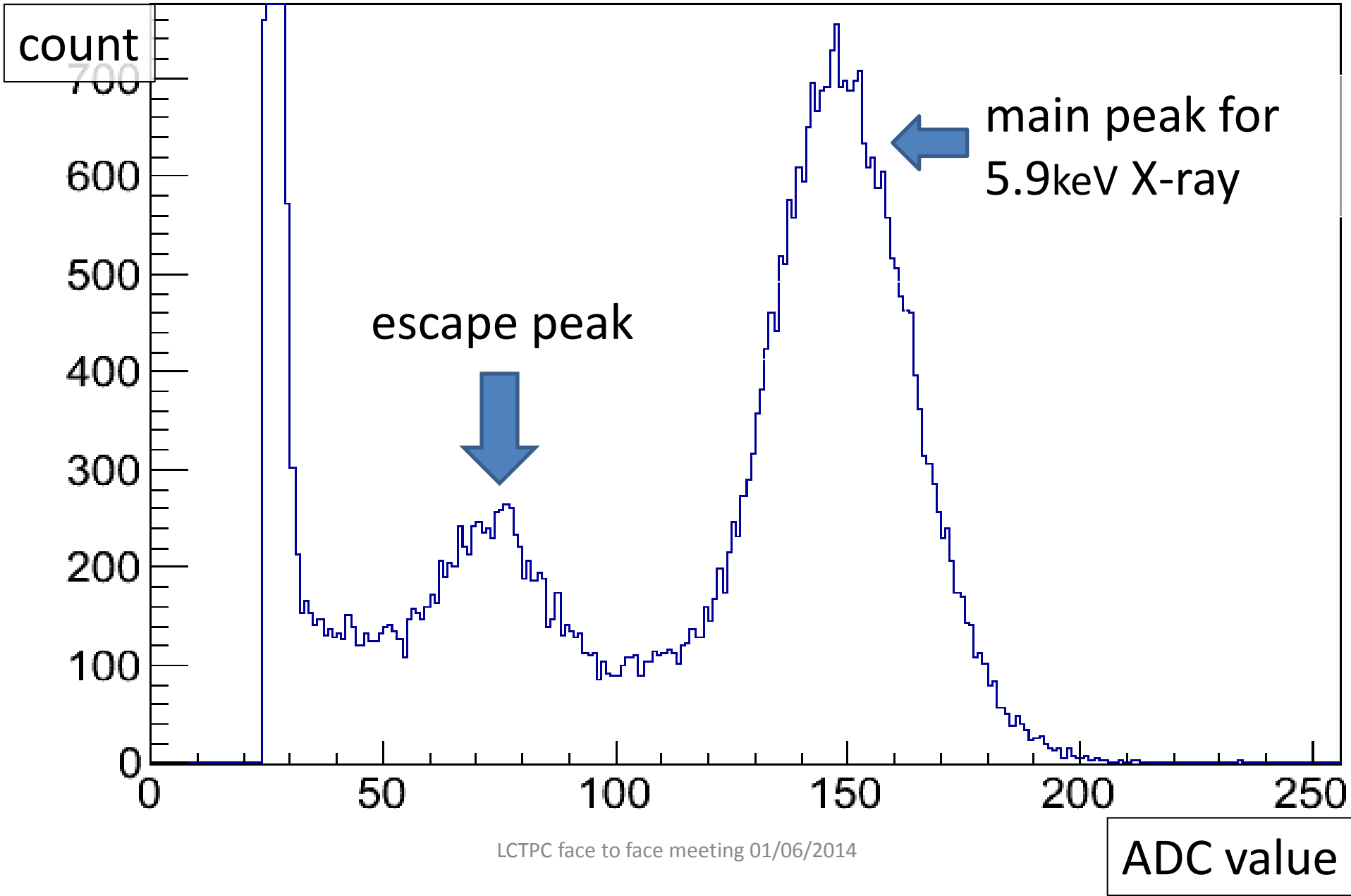


Set up (chamber)



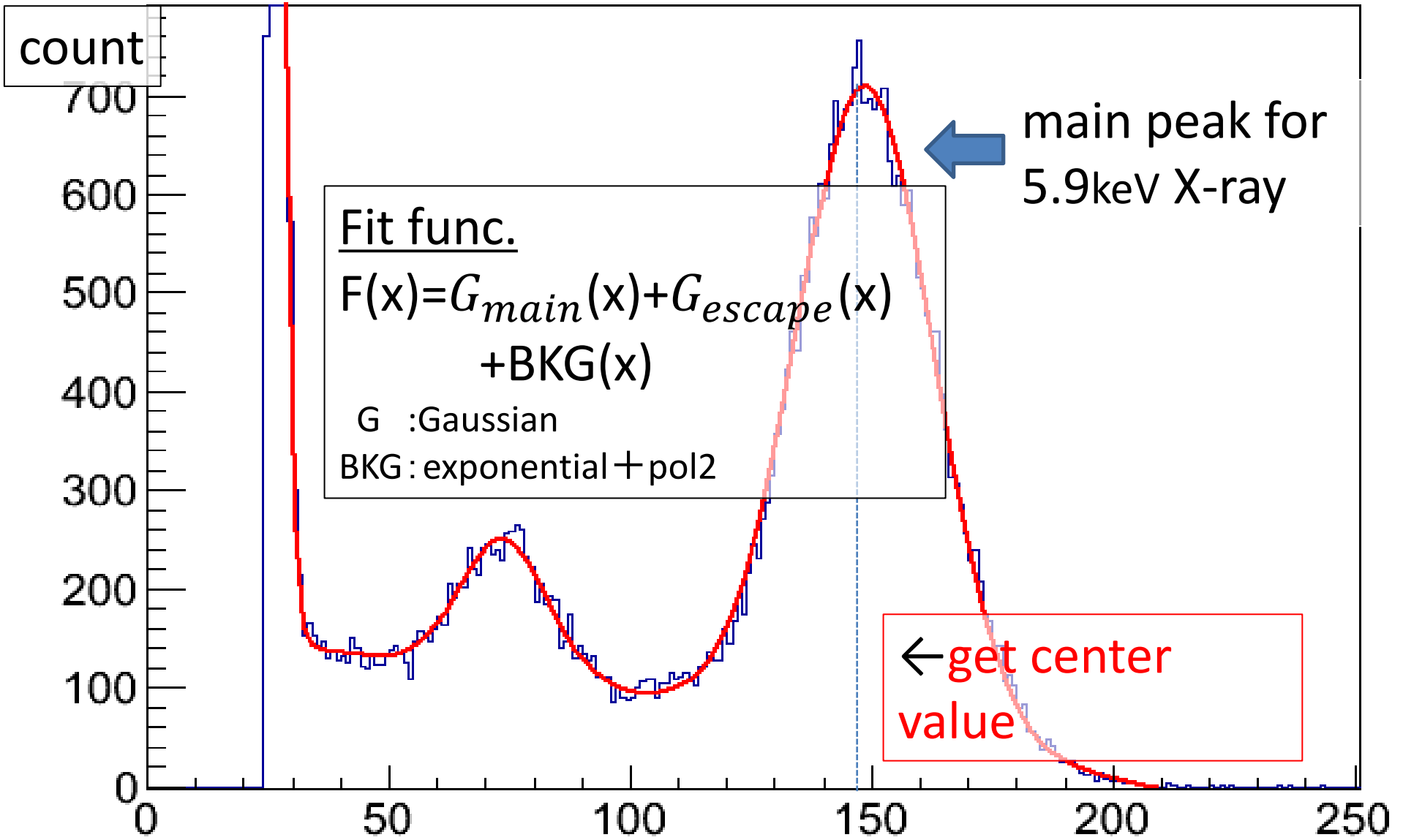
spectrum（example）

Va:325V, Vc:320V



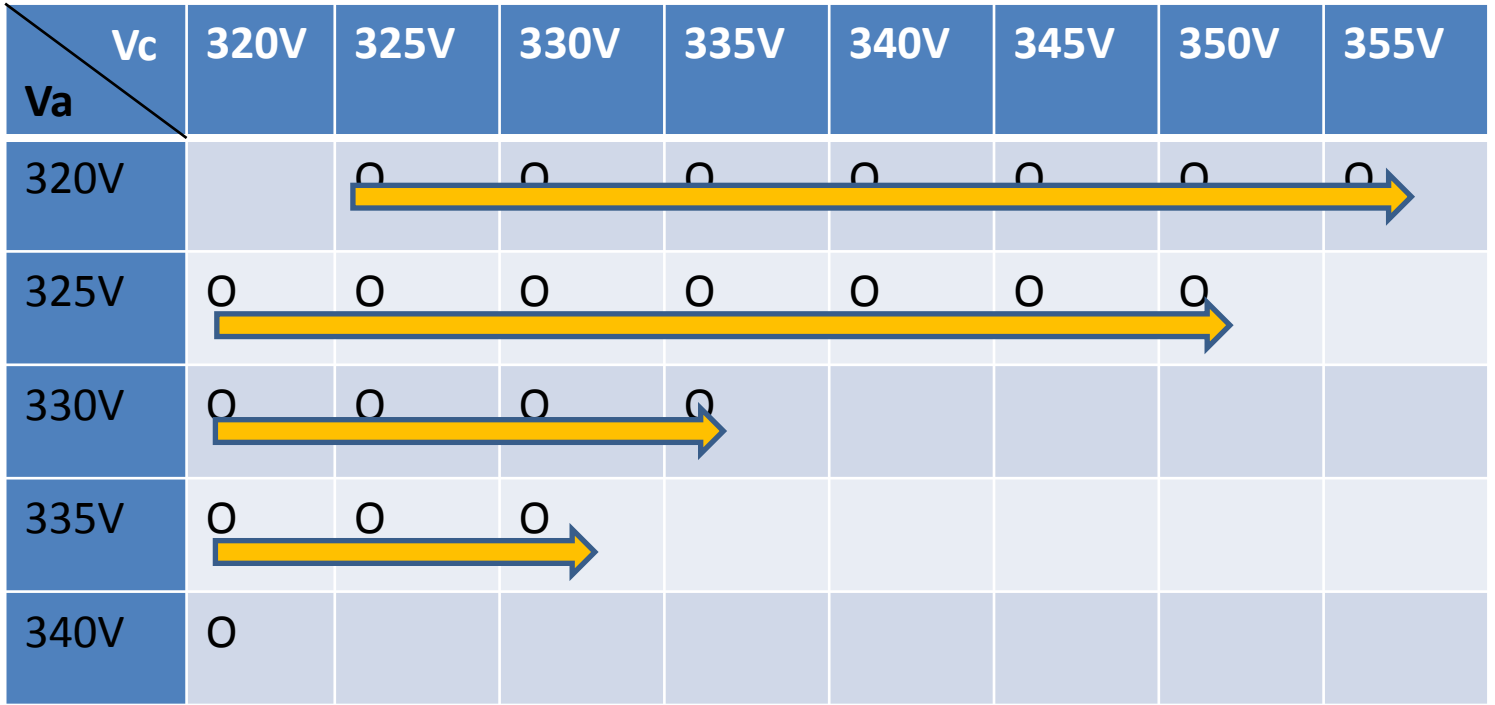
Fitting

Va:325V, Vc:320V

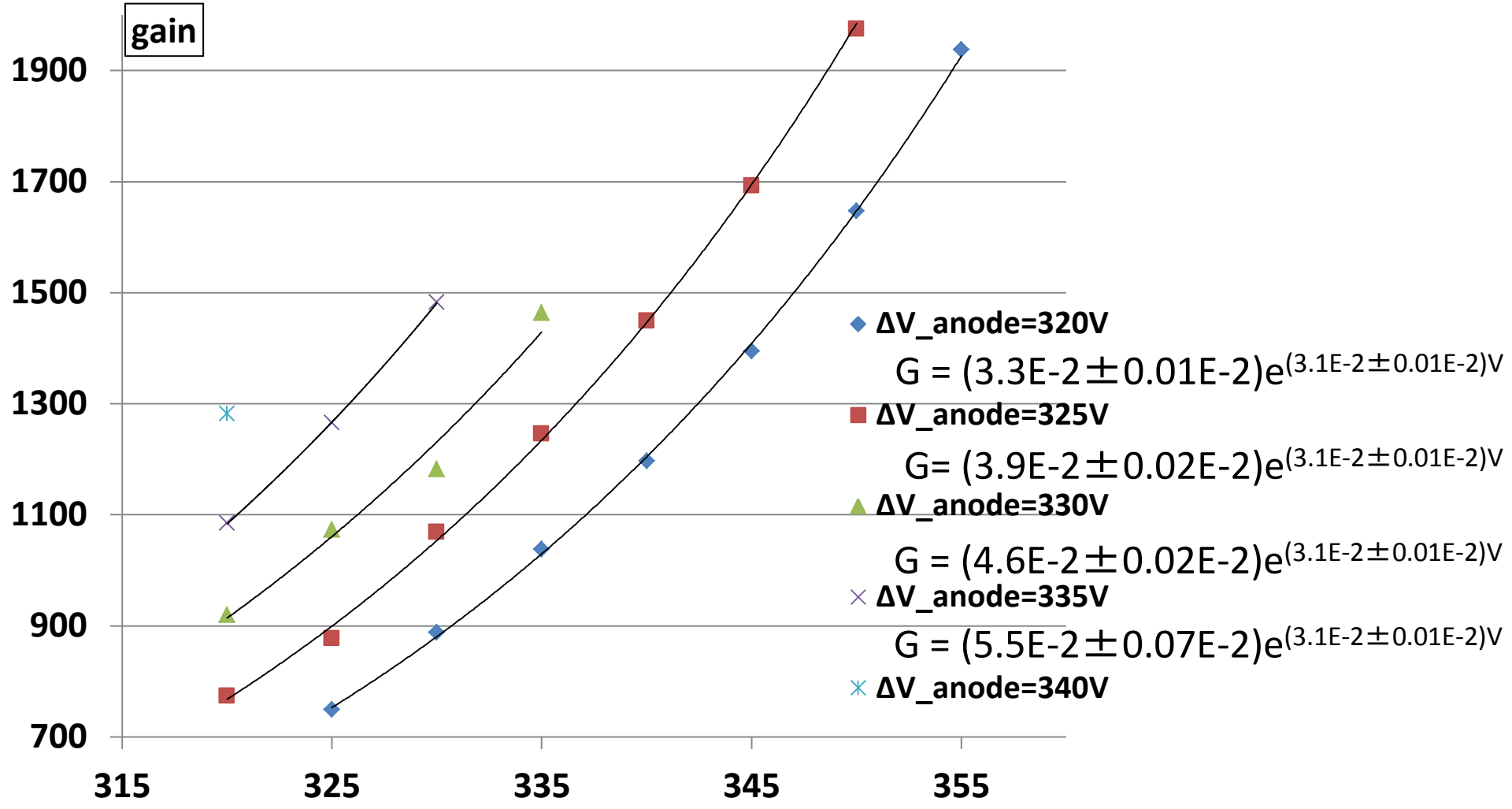


Taking data

- First, fixing Va (volts of anode-side GEM), we measured Vc (volts of cathode-side GEM) dependence of gain.



Gain of new GEM module for voltage of cathode-side GEM

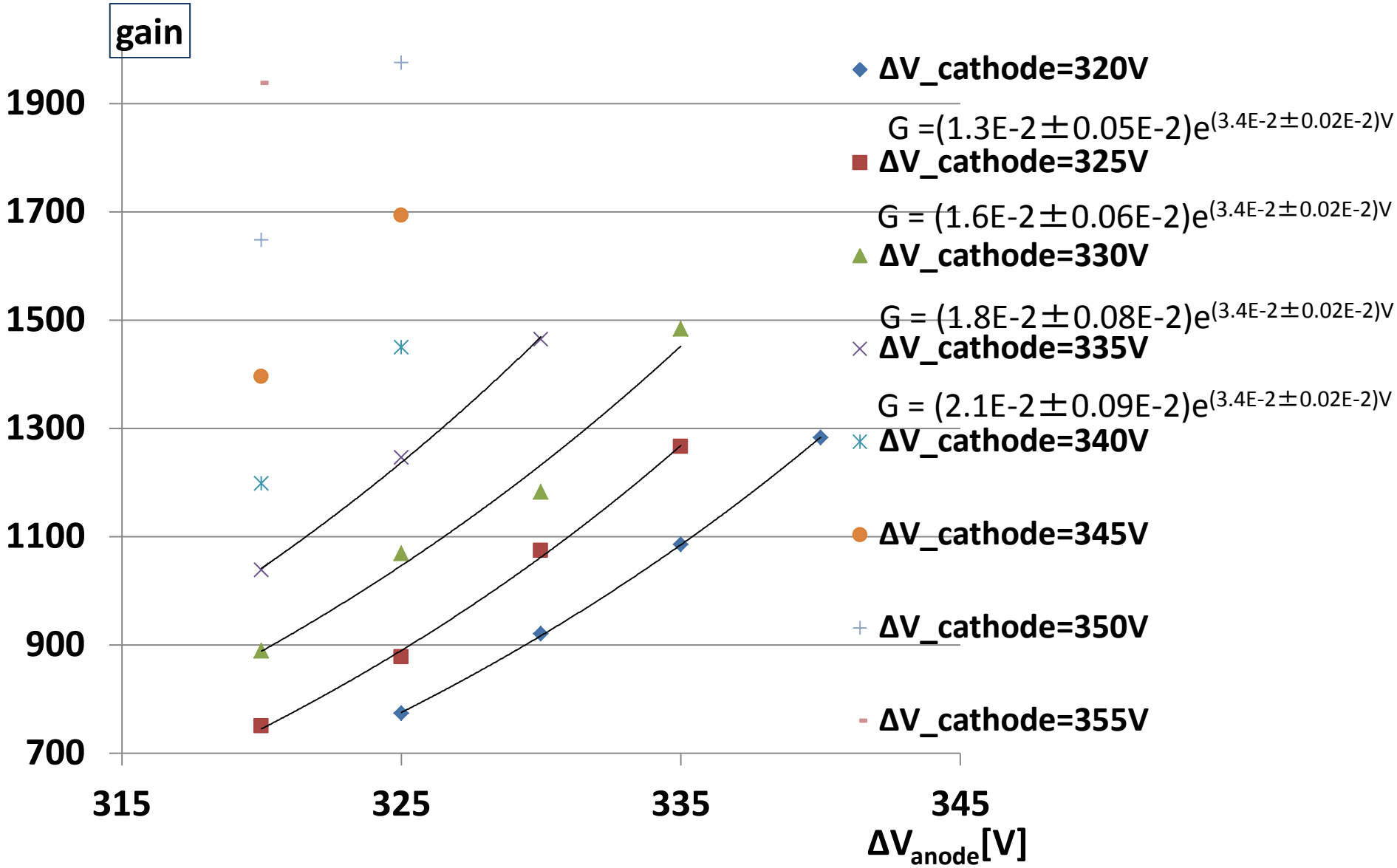


Taking data

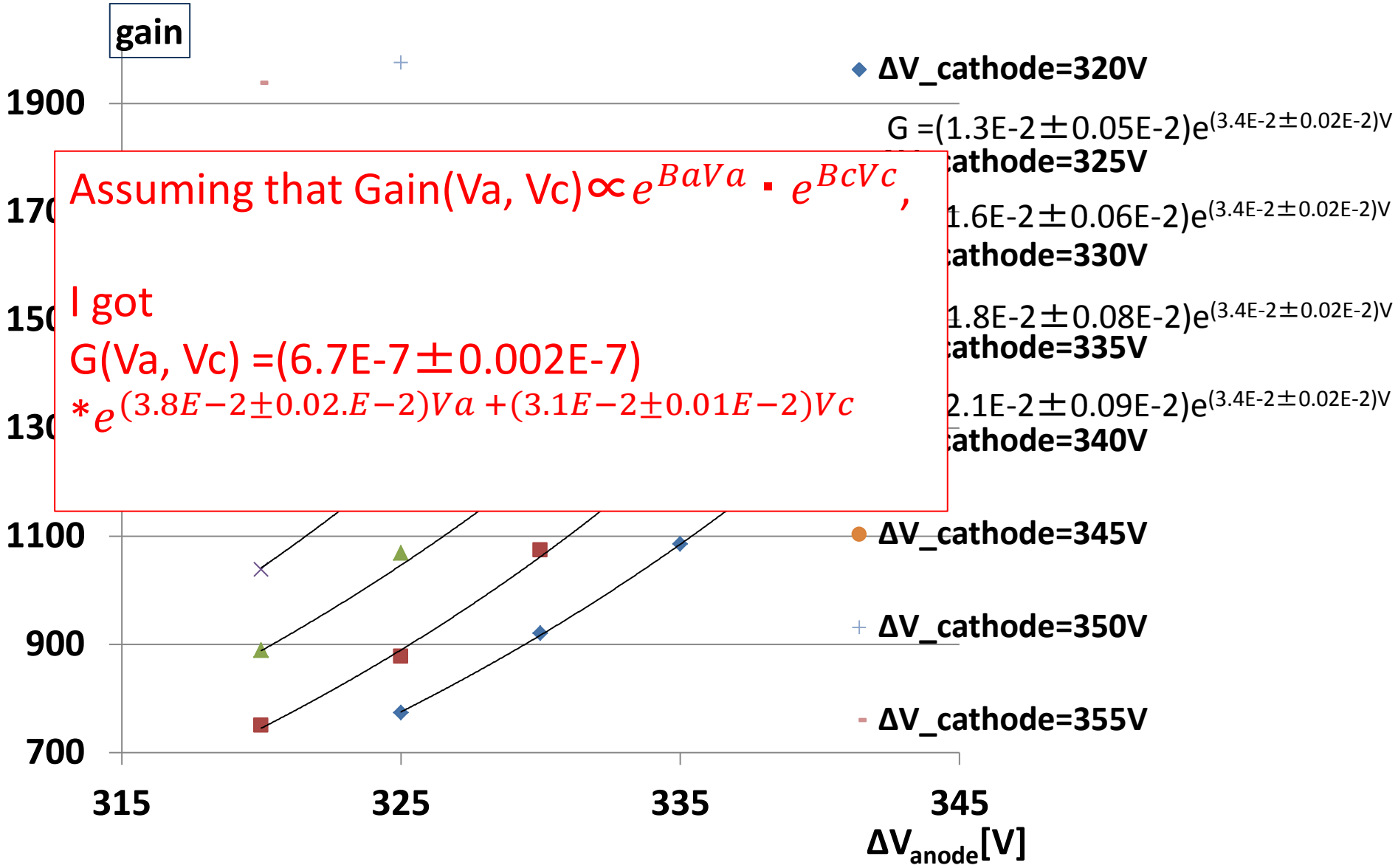
- Similarly, Va dependence of gain is shown in the next slide

Va \ Vc	320V	325V	330V	335V	340V	345V	350V	355V
320V		O	O	O	O	O	O	O
325V	O	O	O	O	O	O	O	
330V	O	O	O	O				
335V	O	O	O					
340V	O							

gain of new GEM module for voltage of anode-side GEM



gain of new GEM module for voltage of anode-side GEM



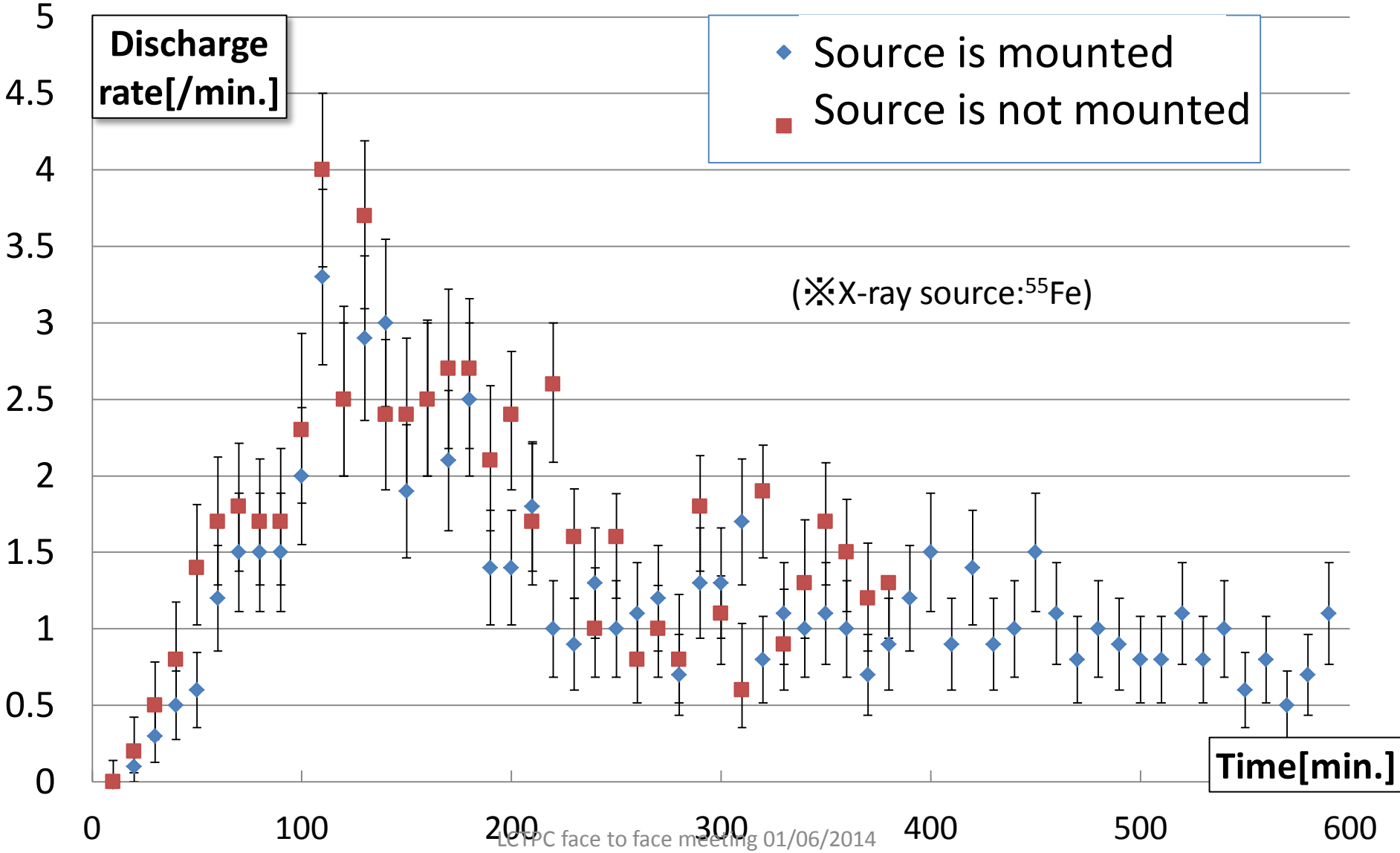
Assuming that Gain(Va, Vc)$\propto e^{BaVa} \cdot e^{BcVc}$,

I got

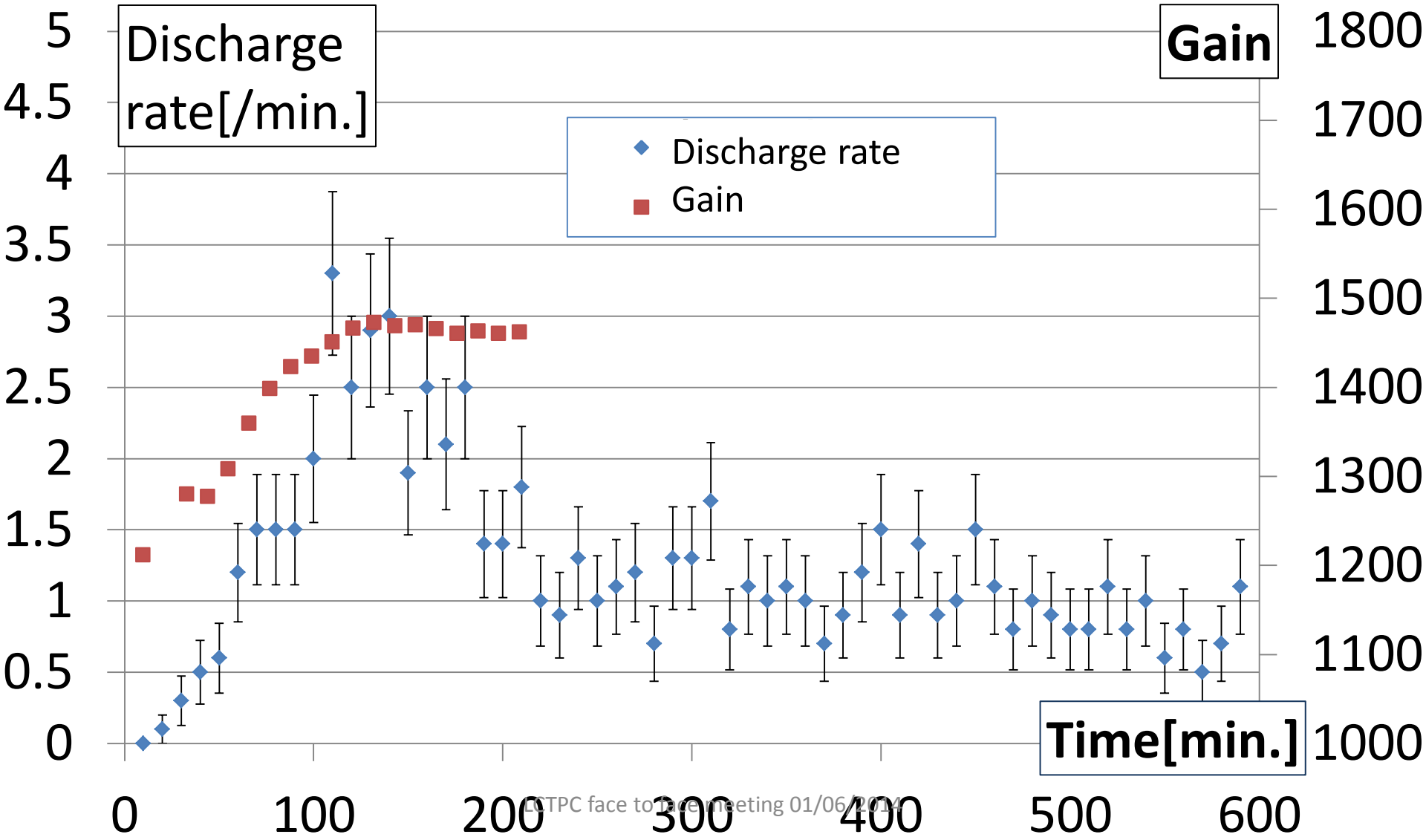
G(Va, Vc) =(6.7E-7±0.002E-7)

$*e^{(3.8E-2\pm0.02.E-2)Va+(3.1E-2\pm0.01E-2)Vc}$

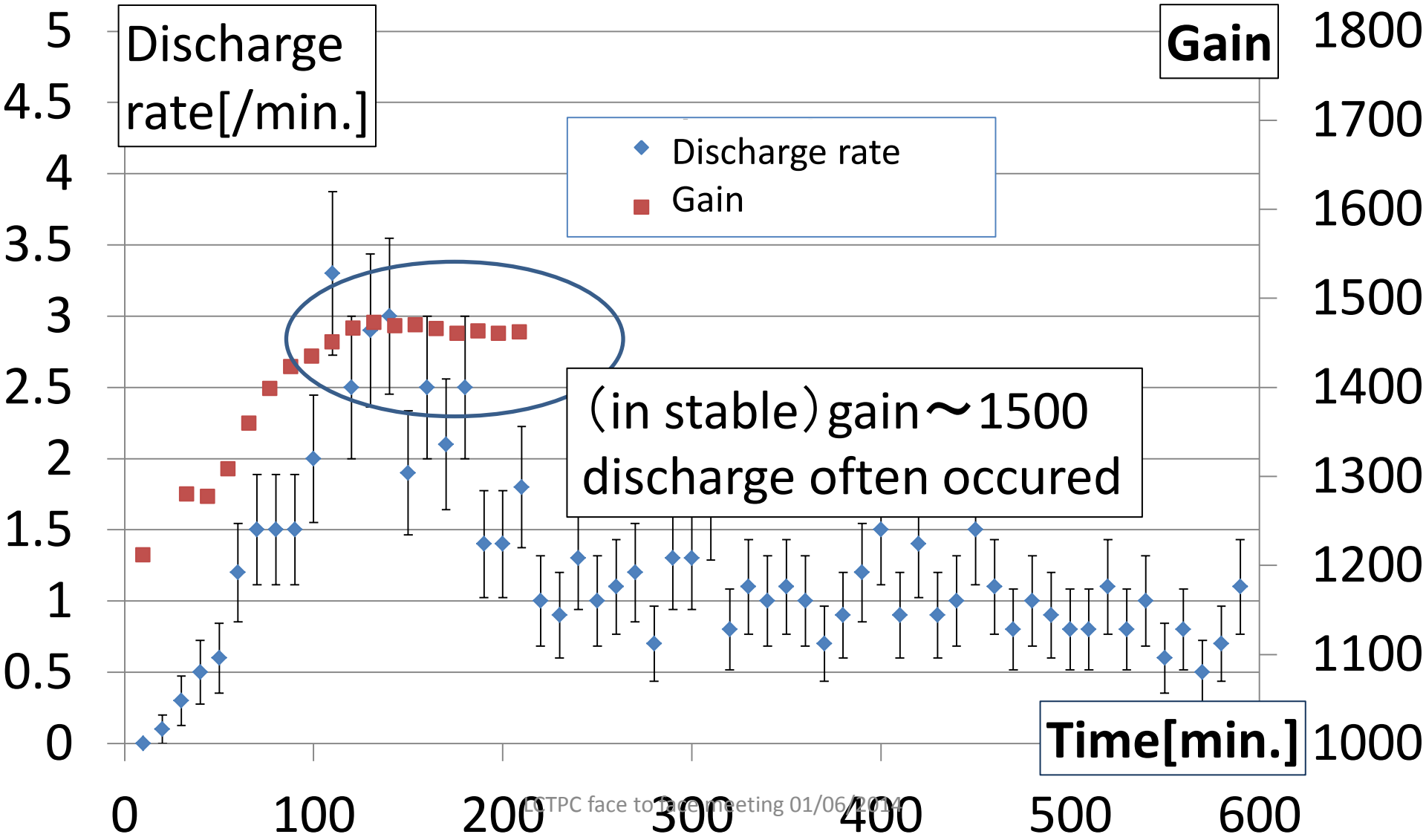
Time dependence of discharge for new GEM module（Va:335V, Vc:330V ）(2013/Sep)



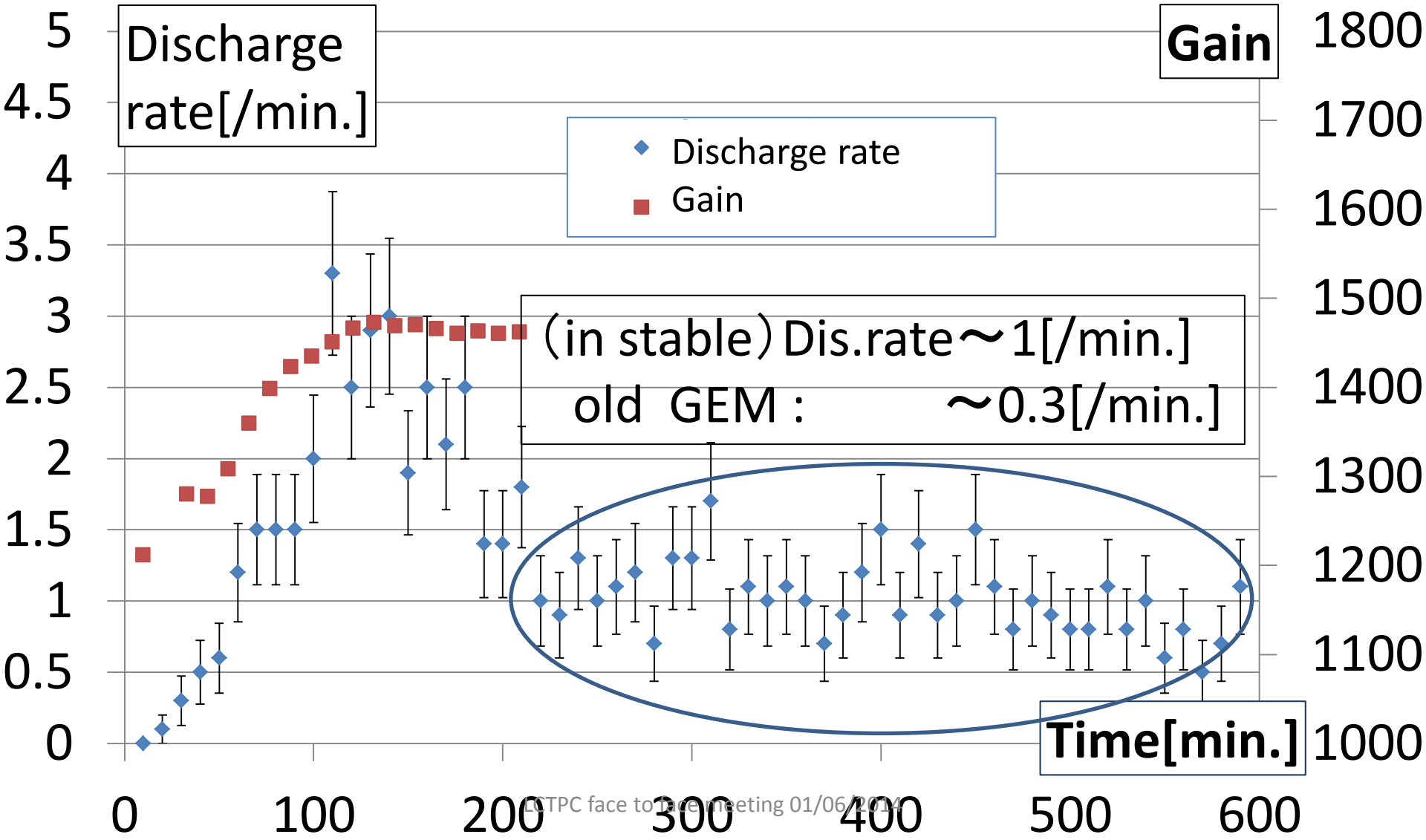
Time dependence of gain and discharge rate for new GEM module（V_a:335V, V_c:330V ）



Time dependence of gain and discharge rate for new GEM module（V_a:335V, V_c:330V ）



Time dependence of gain and discharge rate for new GEM module（V_a:335V, V_c:330V ）



Break…

Information about experiment of laser power dependence of output ADC value for new GEM

- Date: Dec/12th/2013～Dec/13th/2013(@KEK)
- H.V. & laser power (PFN value; %) configuration ↓

Va \ Vc	335V	340V
320V		70%,71%,72%, 73%,74%
330V	70%,71%,72%, 73%,74%	

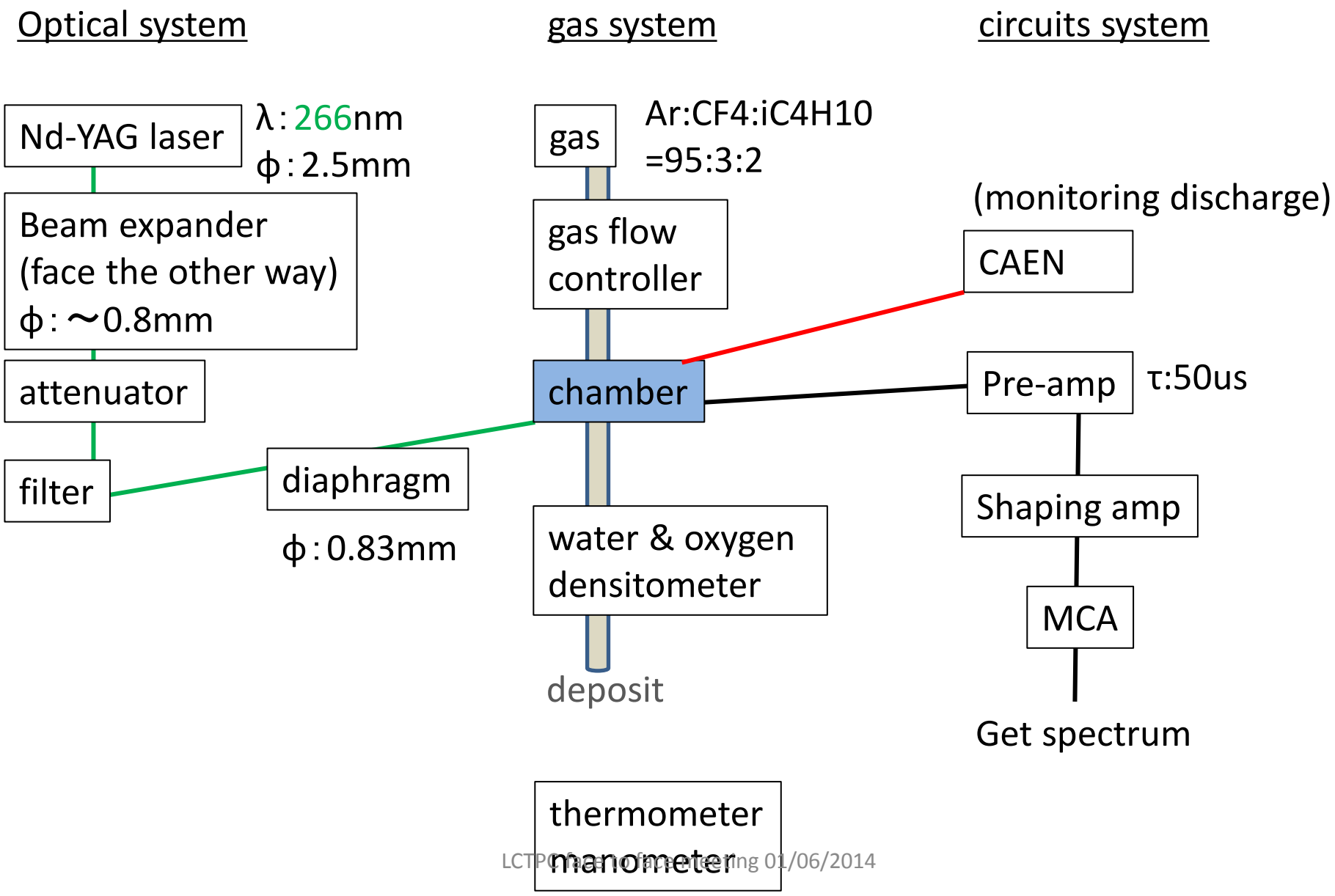
--%:PFN value of Nd-YAG laser

Va: voltage of anode-side GEM

Vc: voltage of cathode-side GEM

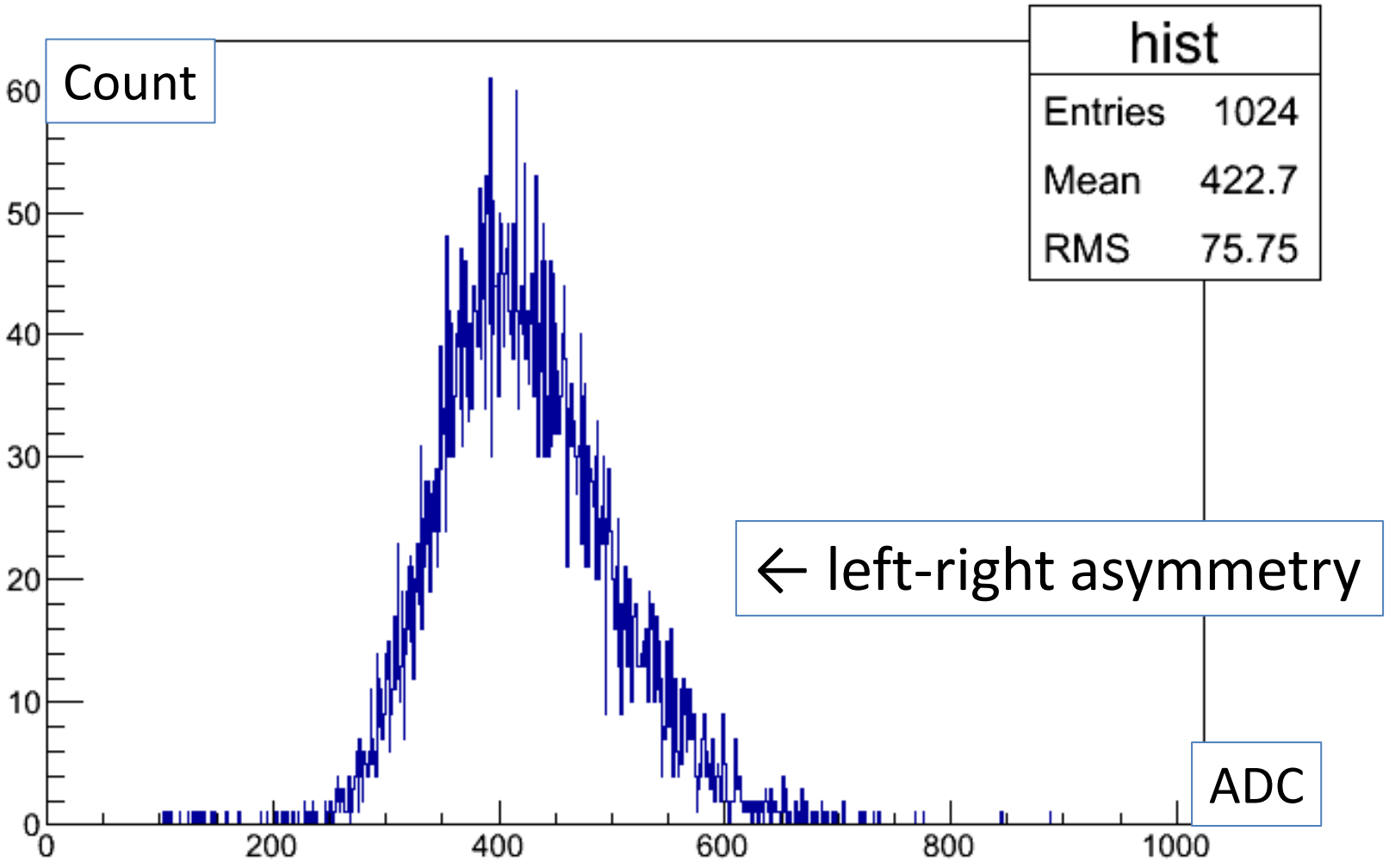
※There were not power meter (and beam profiler too!) at Fuji B4, so we could not know laser power value.

Set up


Optical system
gas system
circuits system
Nd-YAG laser
λ:266nm
ϕ:2.5mm
Beam expander
(face the other way)
ϕ:～0.8mm
attenuator
filter
diaphragm
ϕ:0.83mm
gas
Ar:CF4:iC4H10
=95:3:2
gas flow
controller
chamber
water & oxygen
densitometer
deposit
thermometer
manometer
(monitoring discharge)
CAEN
Pre-amp
τ:50us
Shaping amp
MCA
Get spectrum

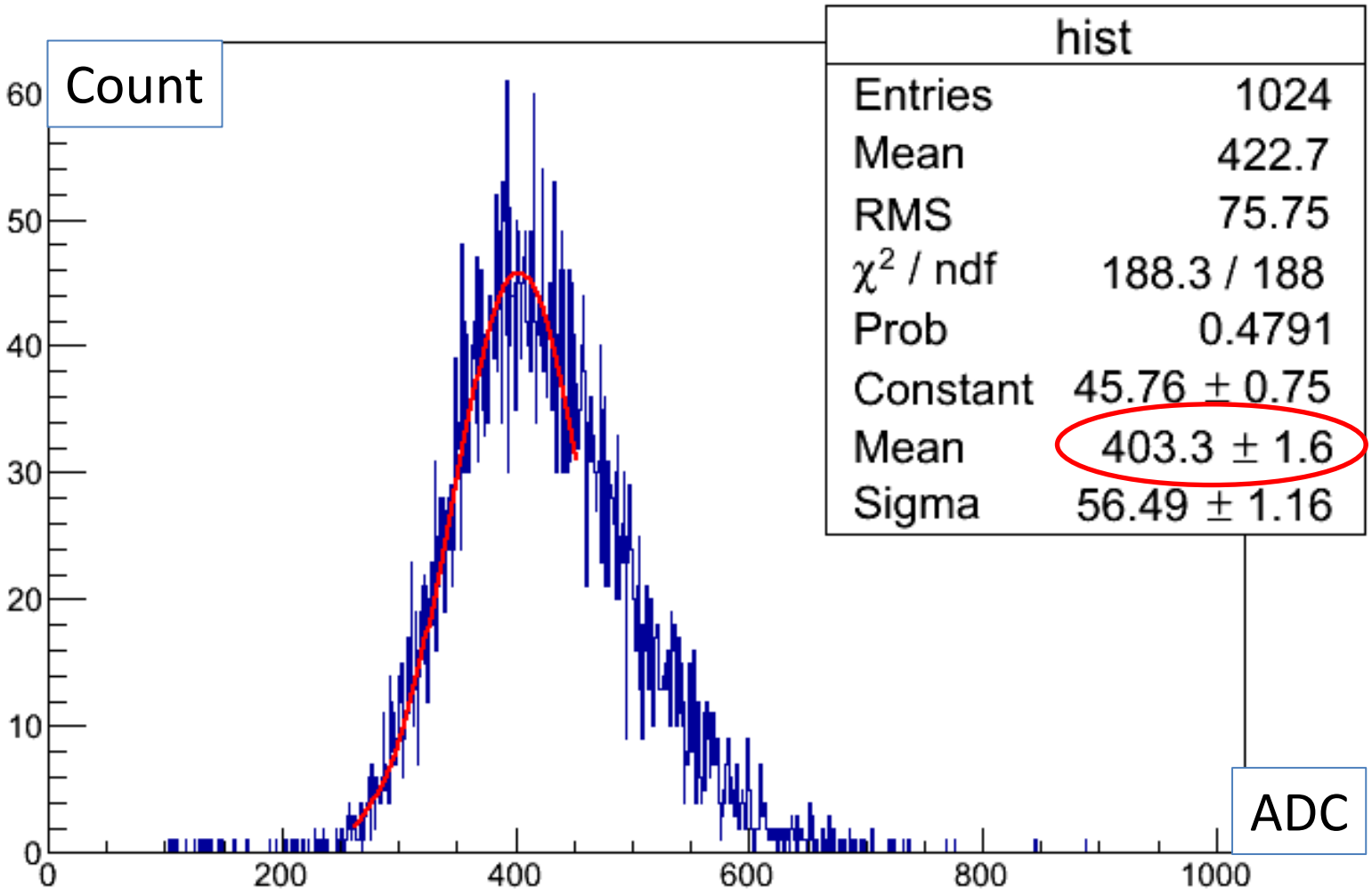
Example of spectrum

(Va:320V, Vc:340V, PFN73%)

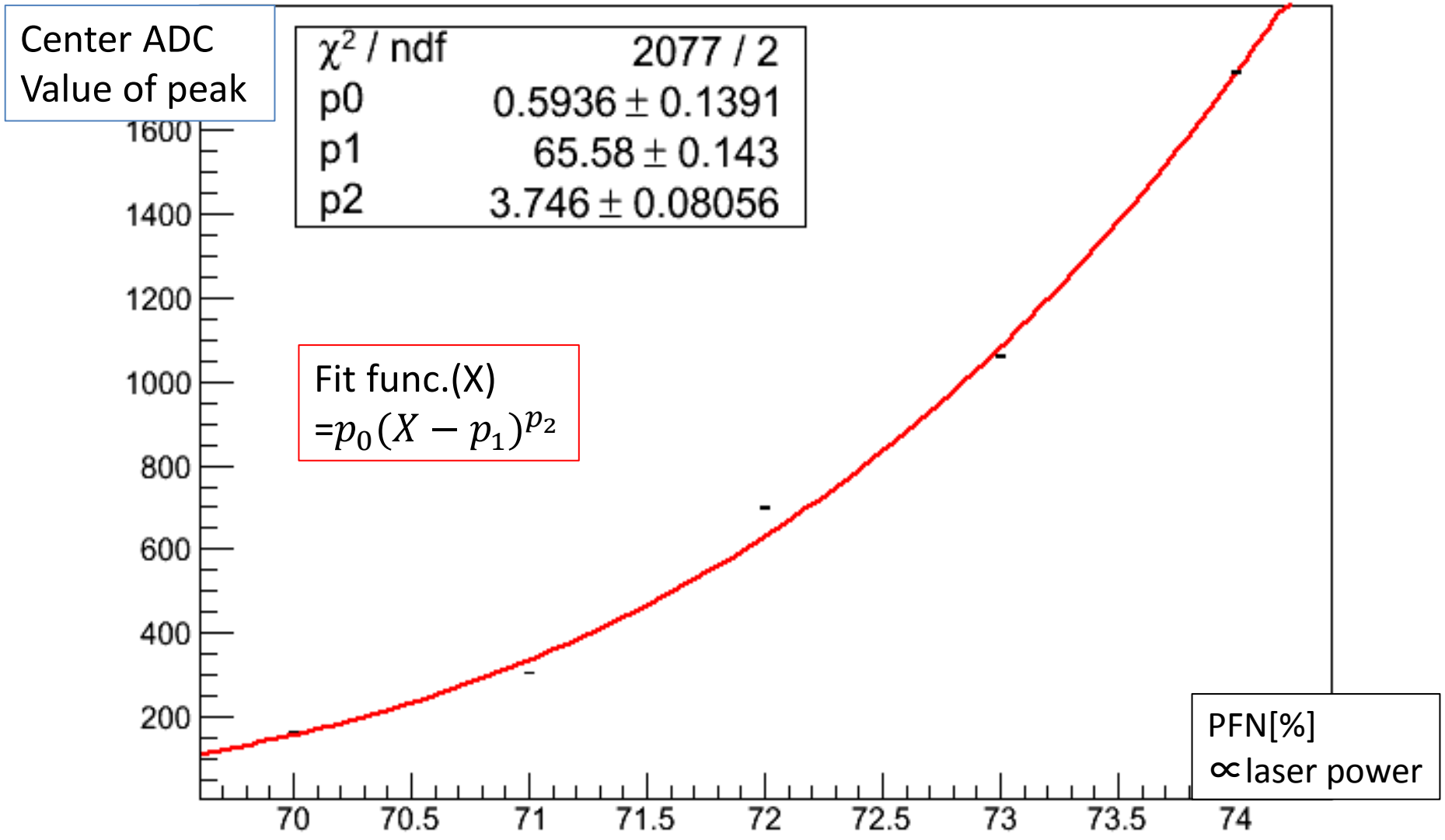


Fitting------using a gaussian

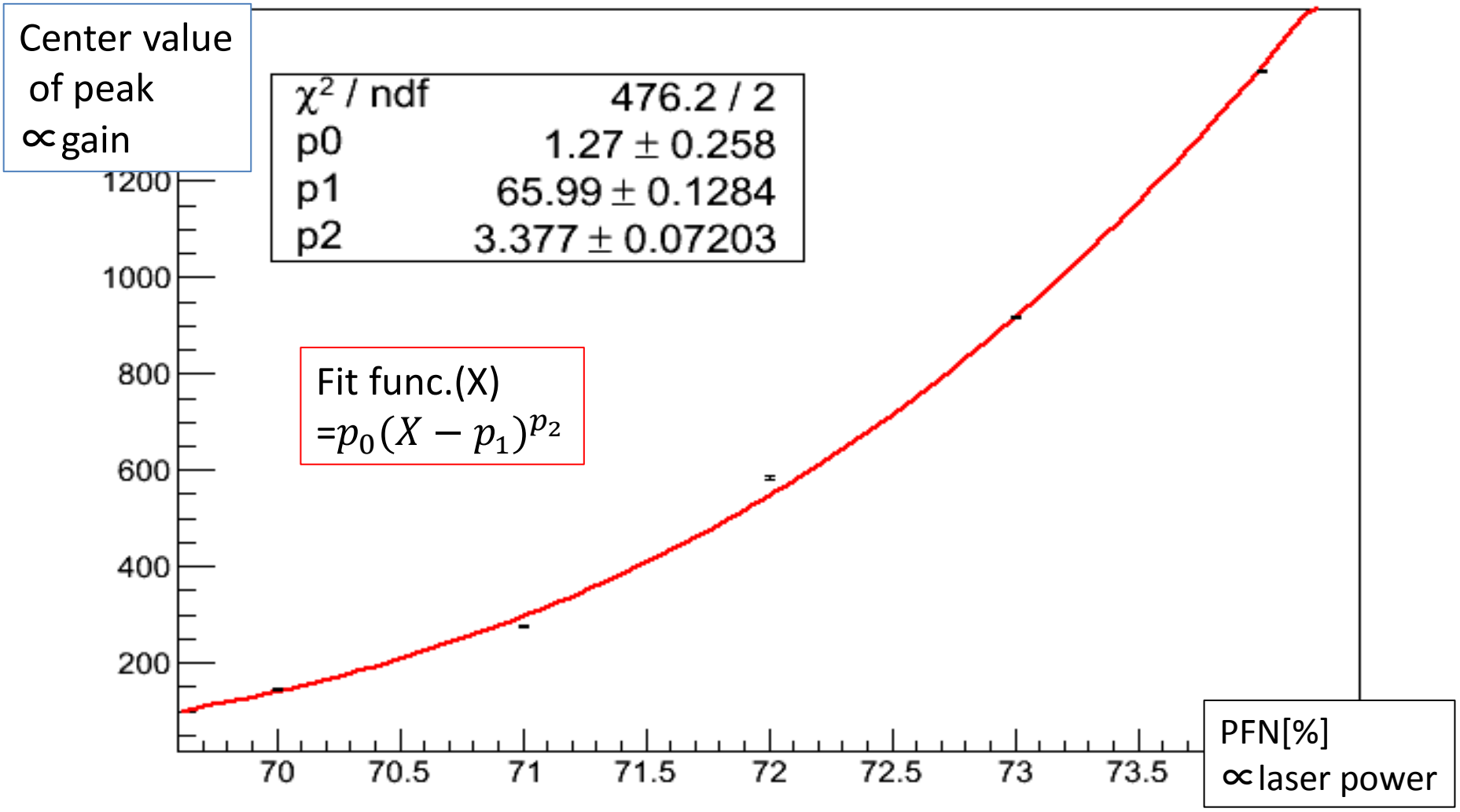
(Va:320V, Vc:340V, PFN73%)



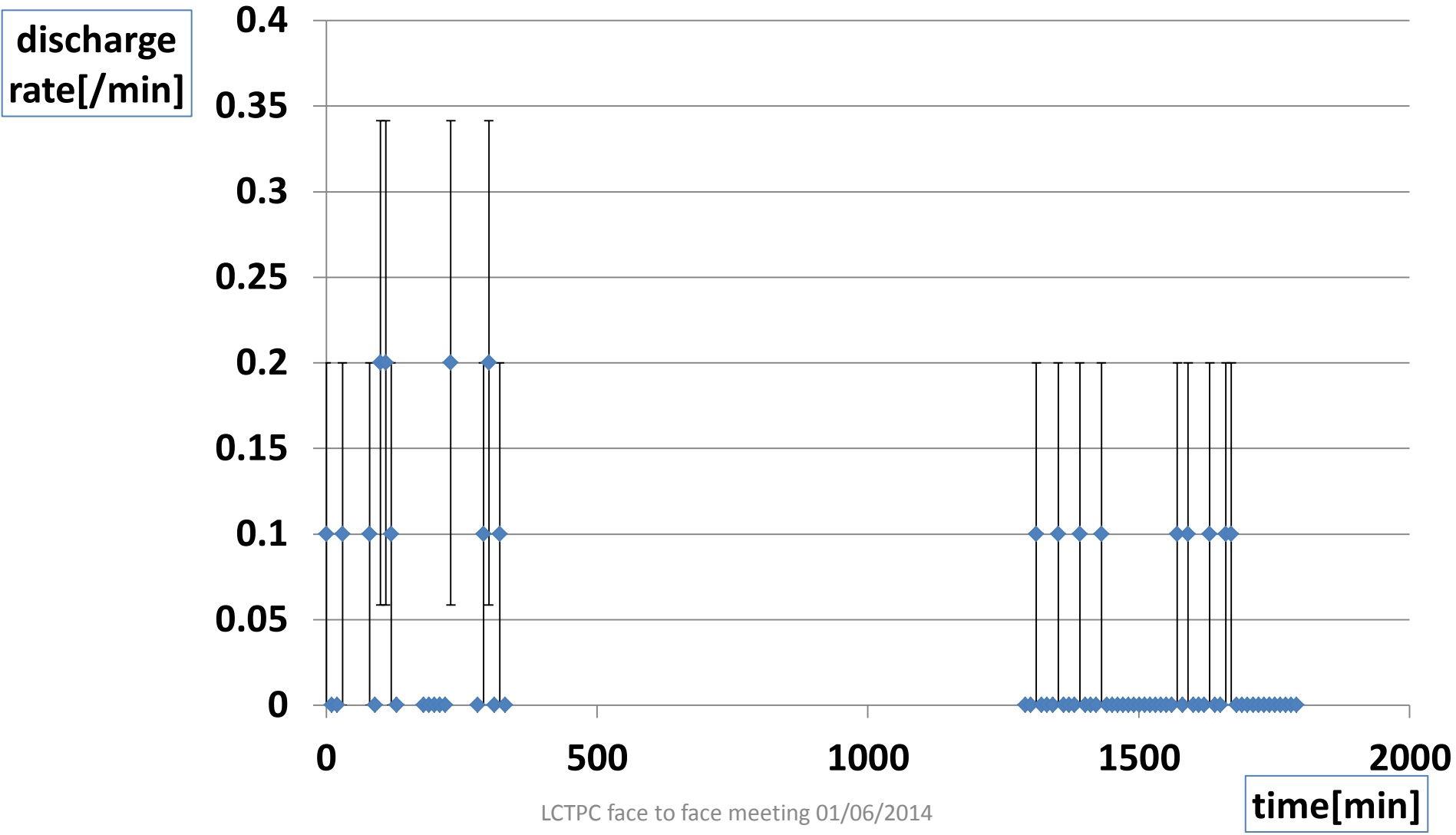
Laser power dependence of output ADC value (Va:330V, Vc:335V)



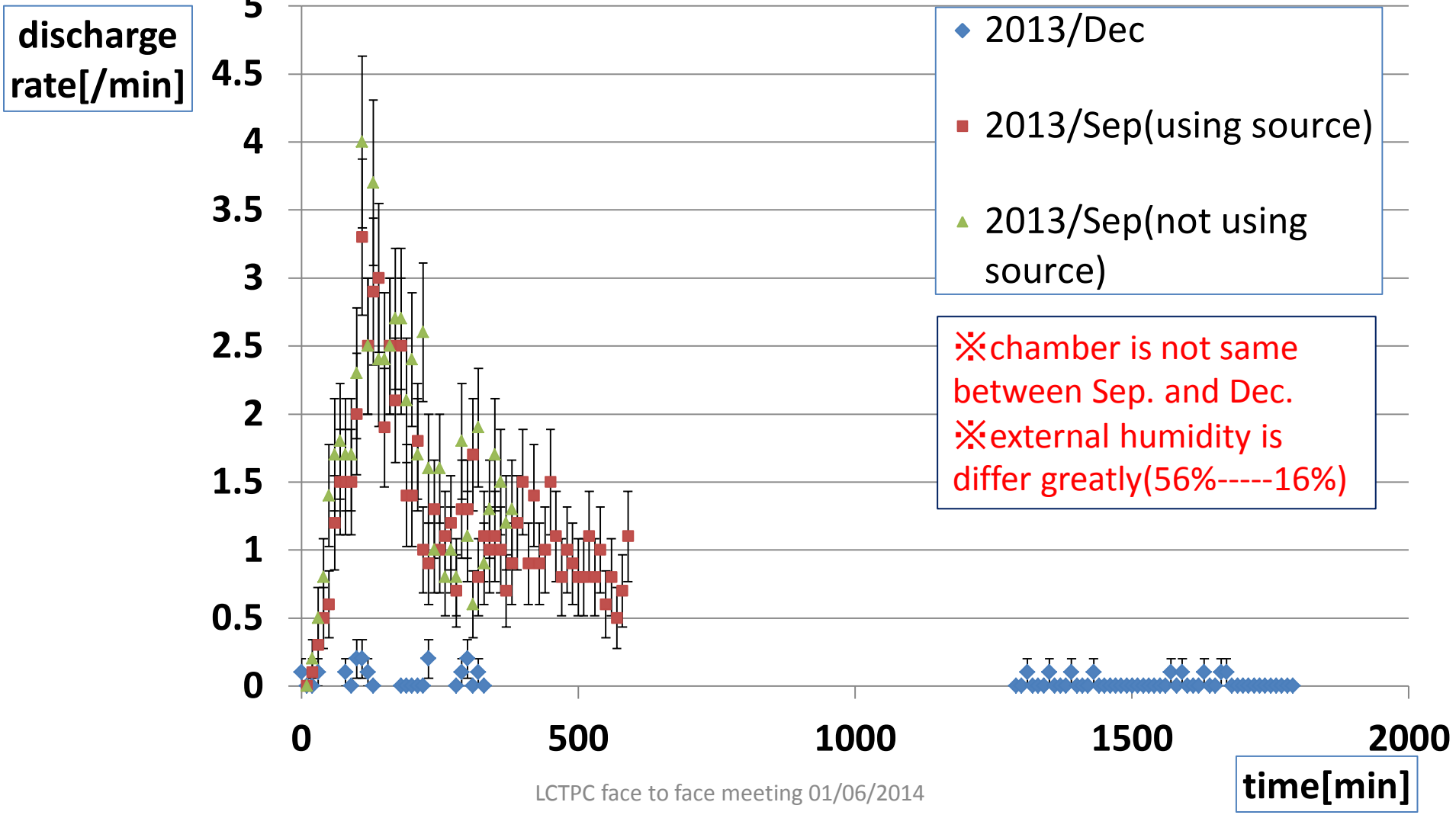
Laser power dependence of output ADC value (Va:320V, Vc:340V)



Time dependence of discharge for new GEM module（Va:320V~330V, Vc:335V~355V ）(2013/Dec)



Summary of the discharge rate for new GEM



summary

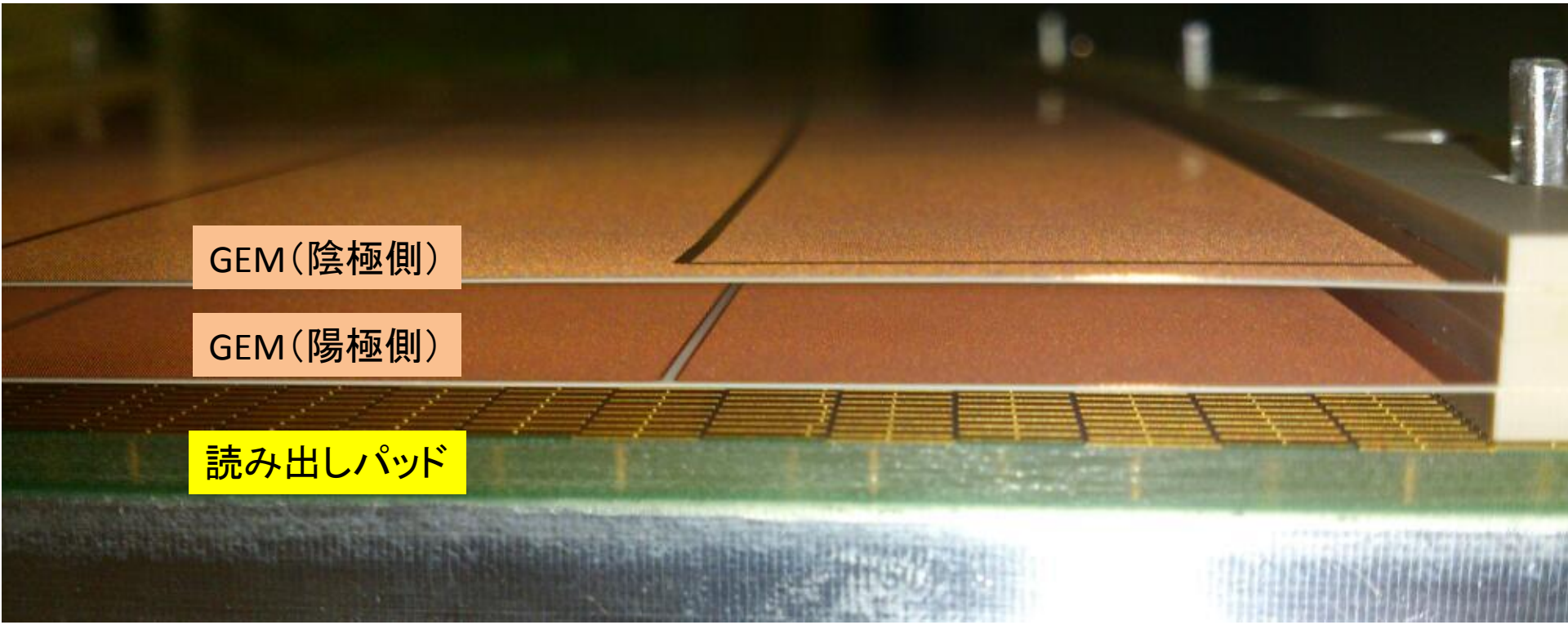
- We checked H.V. dependence of gain and time dependence of gain and discharge for new GEM
  - Discharge rate was larger than old ones (but discharge rate of new GEM is differ in seasons?).
- We checked laser power dependence of gain for new GEM
  - Gain is proportion to laser-power to the power 3.4~3.7.
  - This is need to be studied more.

Future plan

- I will study about the wire-gate.
  - test with 55Fe, laser, magnet
- From tomorrow, some students(including me) is going to work at Fuji B4.
  - Restore ,then measure
- We want to get data of Fe-source and laser with common chamber.
  - New chamber is needed?

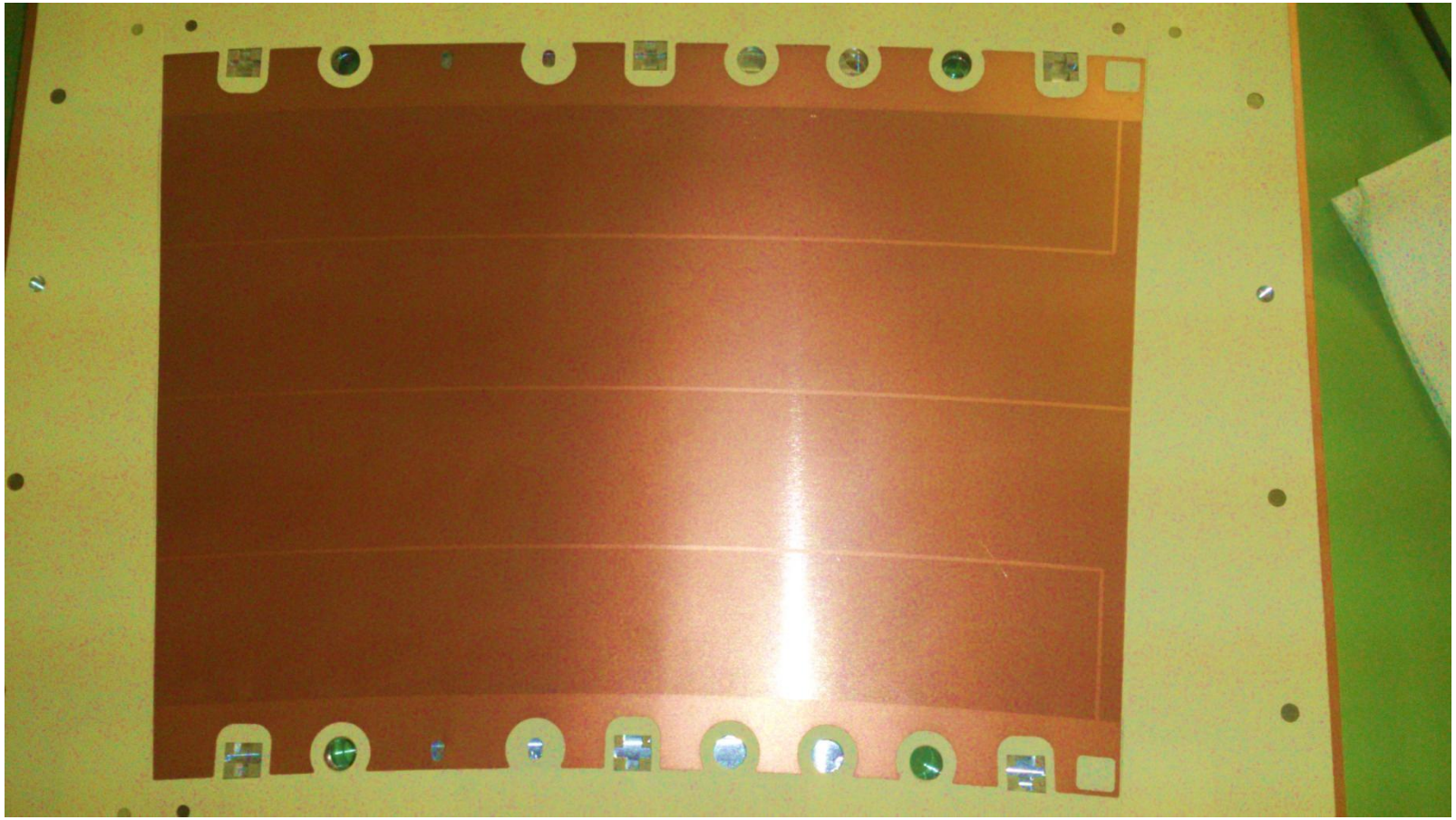
Backup

GEMモジュールの写真

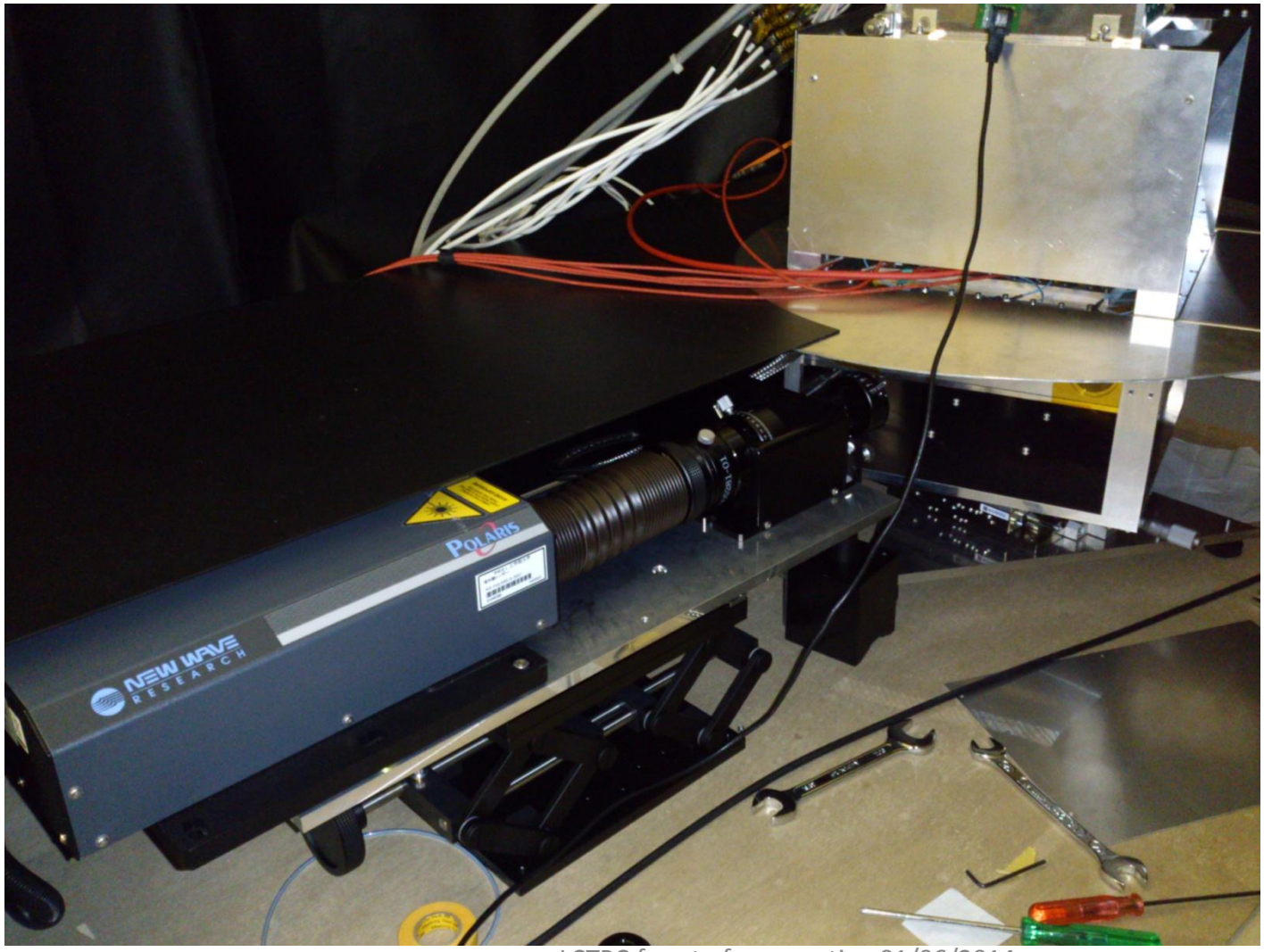


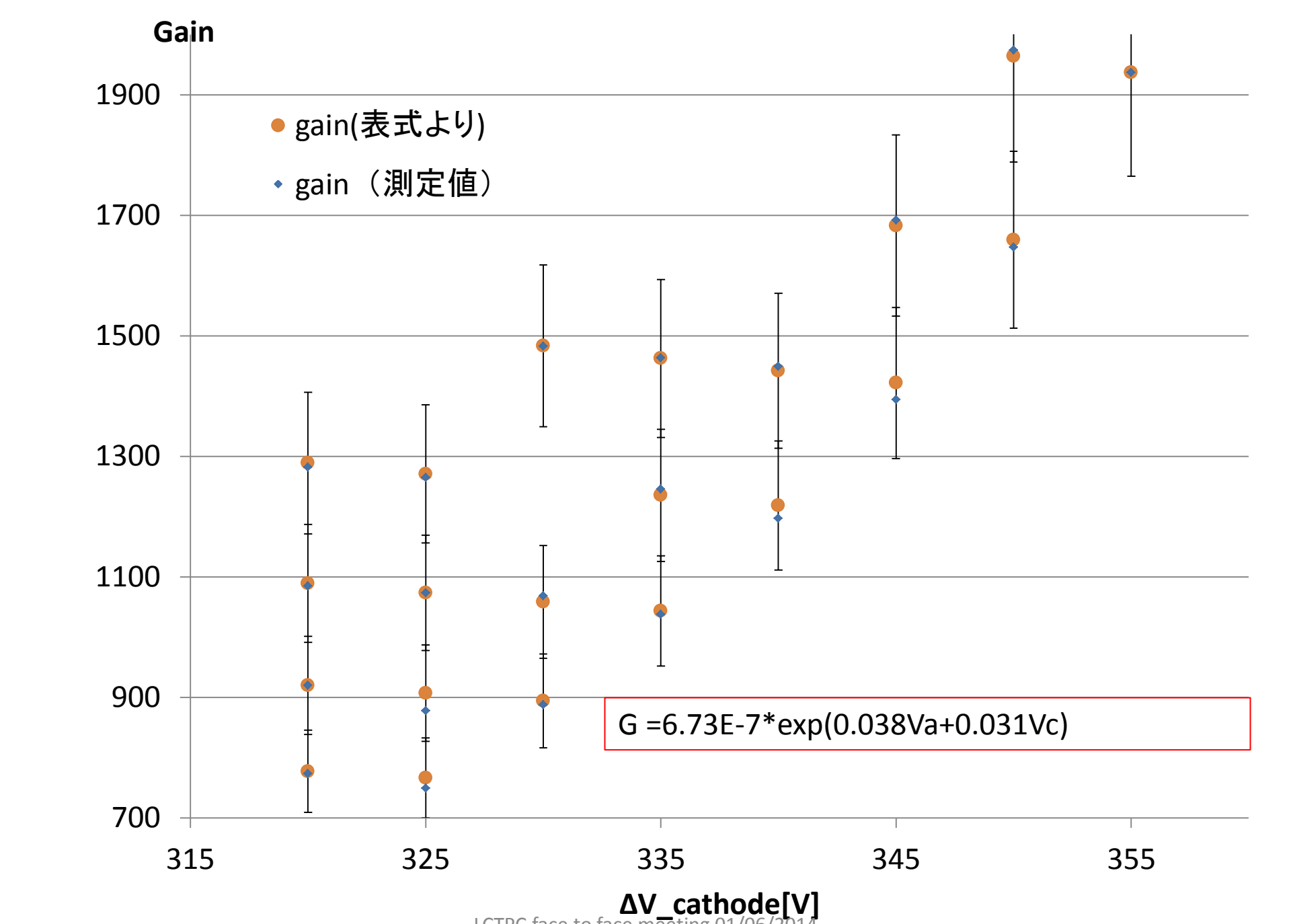
放電時への対策

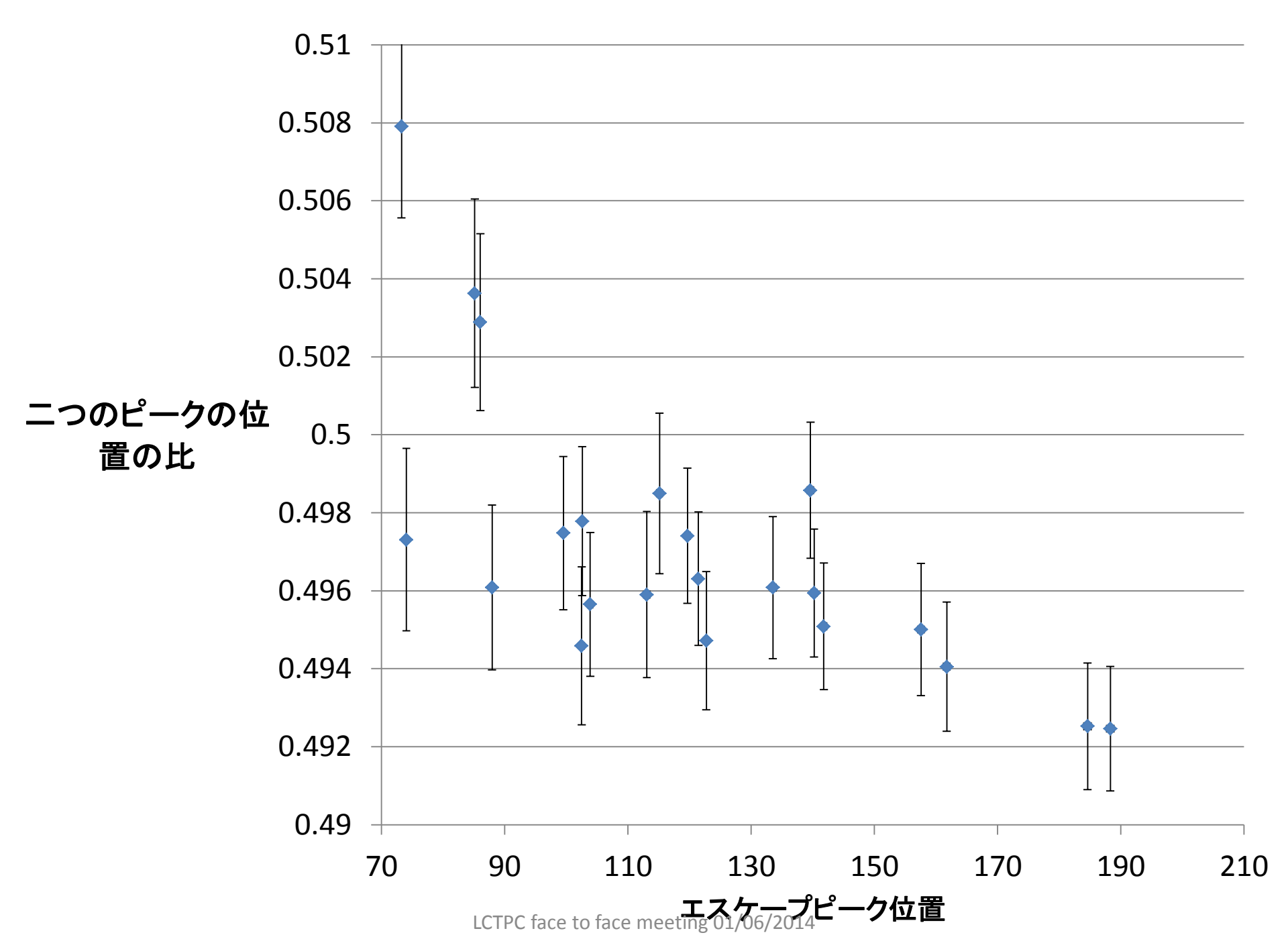
1mm幅の隙間で領域を4分割



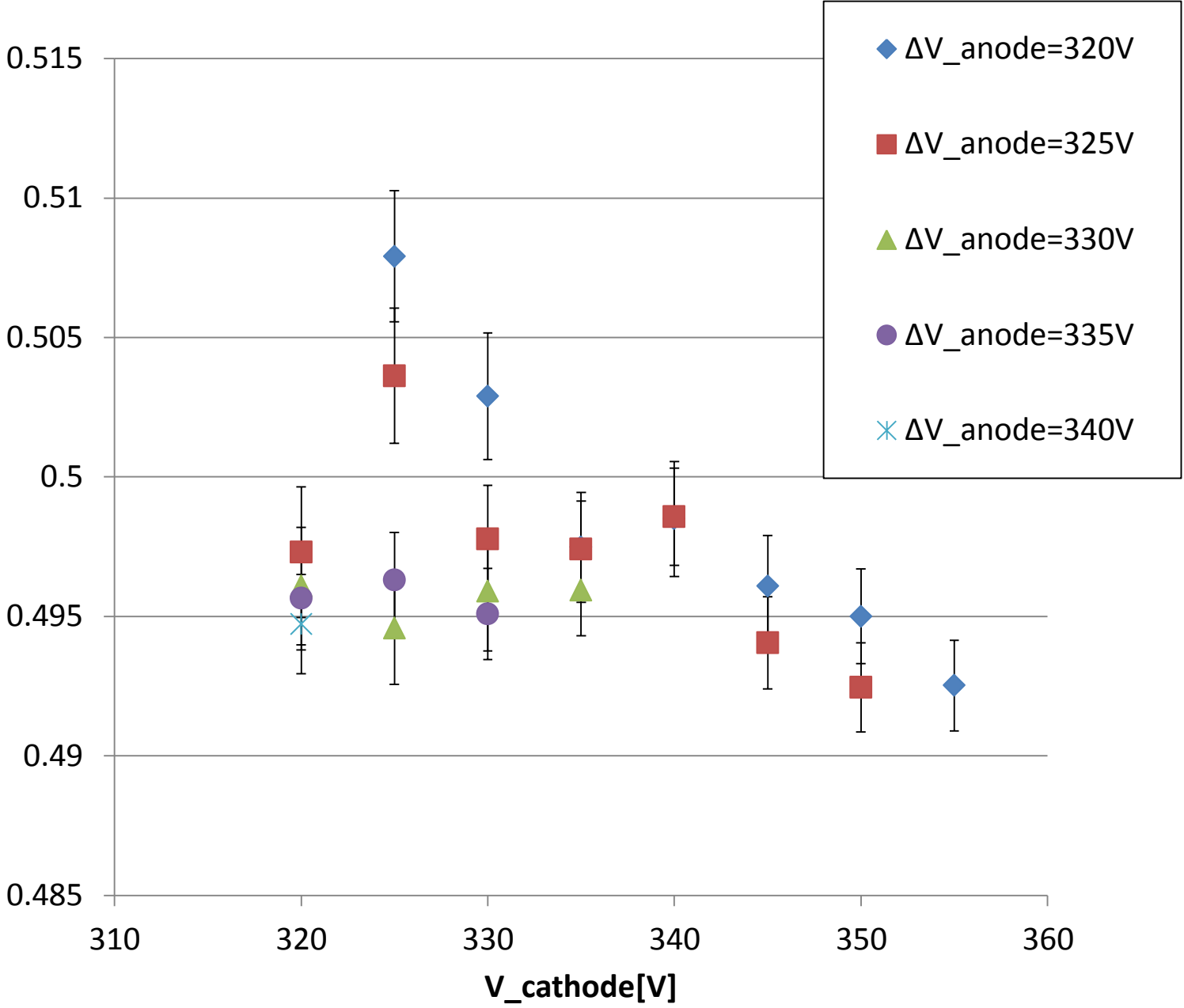
Uvlaser system



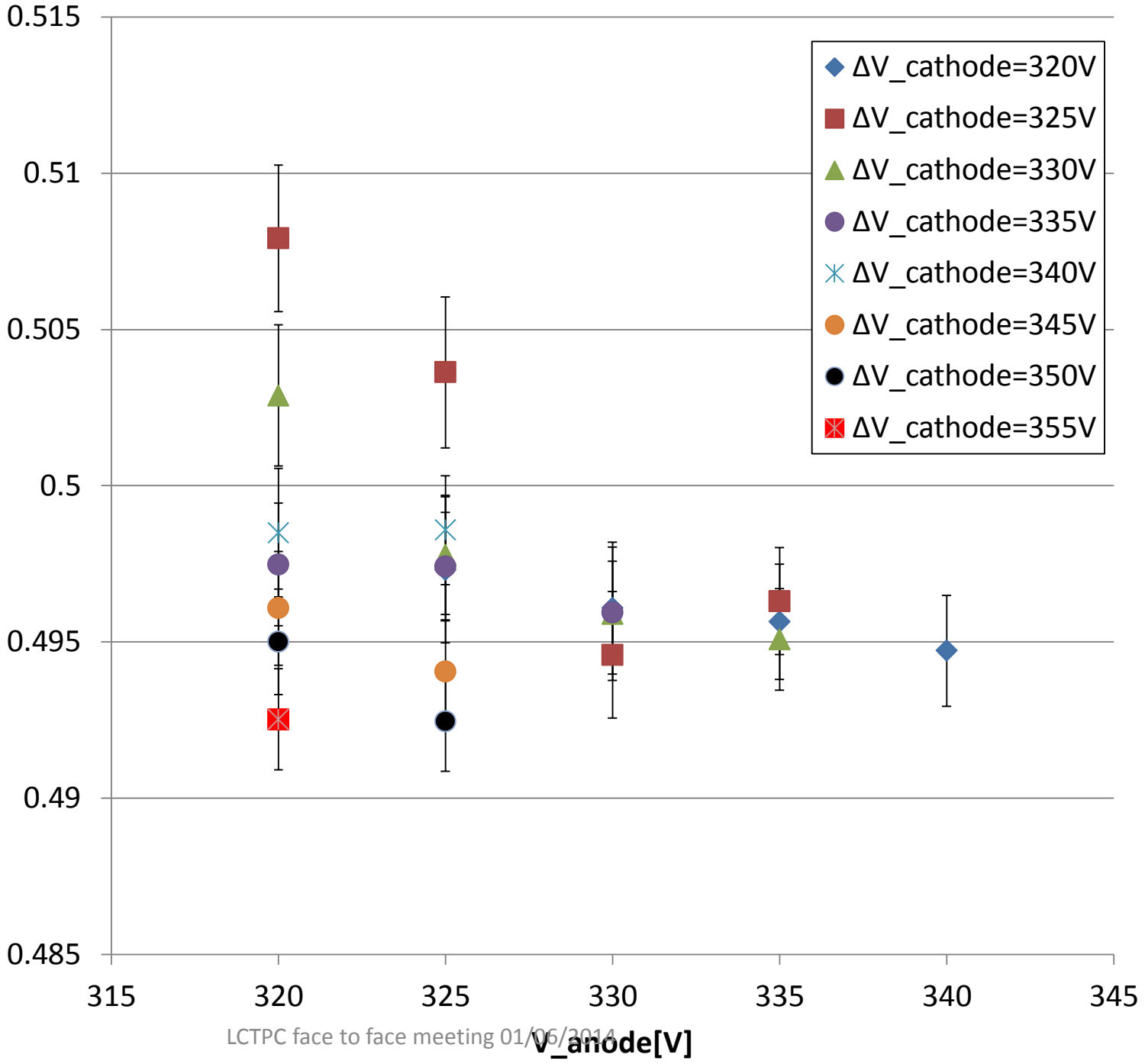

Gain
1900
1700
1500
1300
1100
900
700
gain(表式より)
gain（測定値）
G =6.73E-7*exp(0.038Va+0.031Vc)
315
325
335
345
355
ΔV_cathode[V]

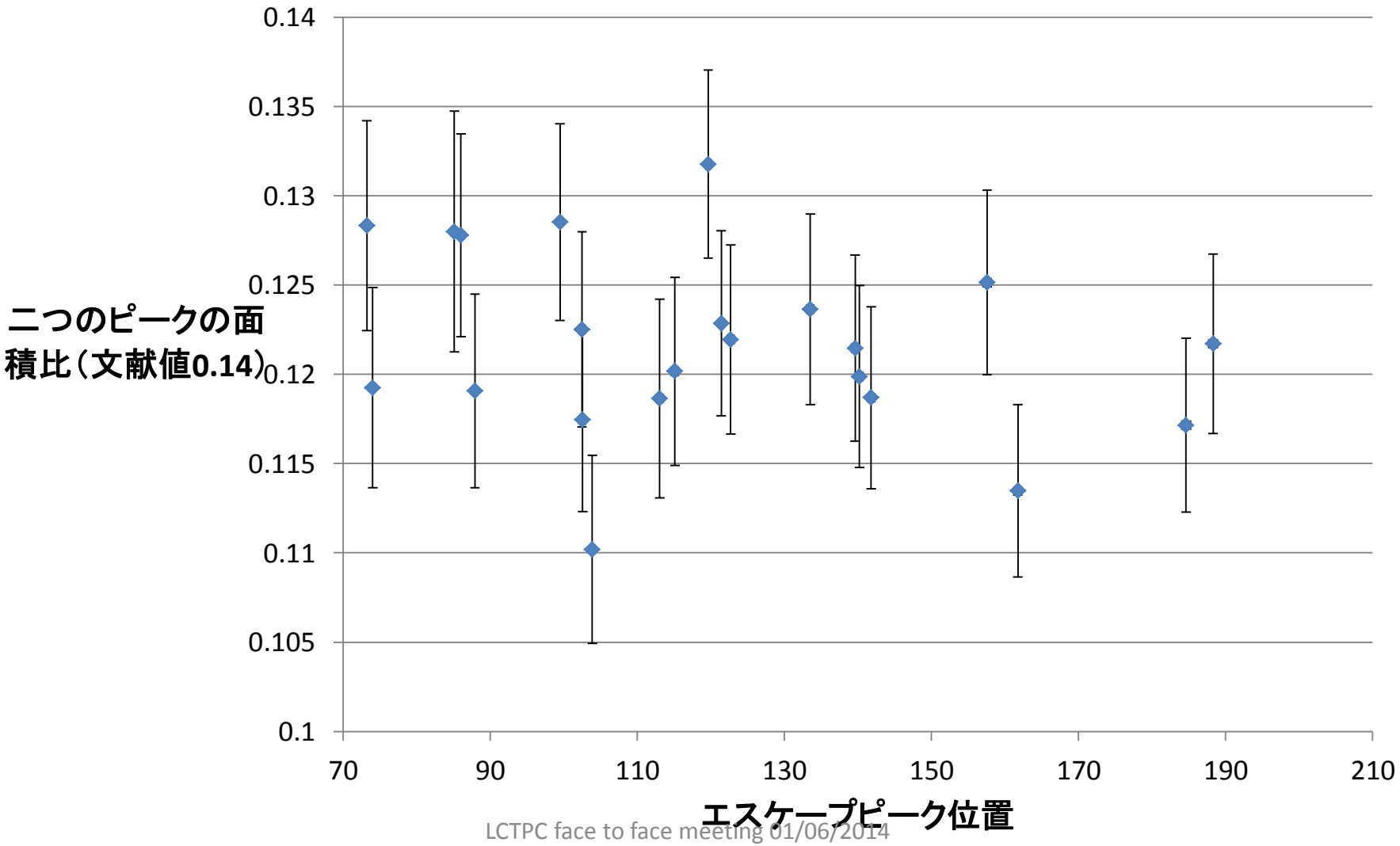

二つのピークの位置の比
0.51
0.508
0.506
0.504
0.502
0.5
0.498
0.496
0.494
0.492
0.49
70
90
110
130
150
170
190
210
エスケープピーク位置

二つのピークの位置の比

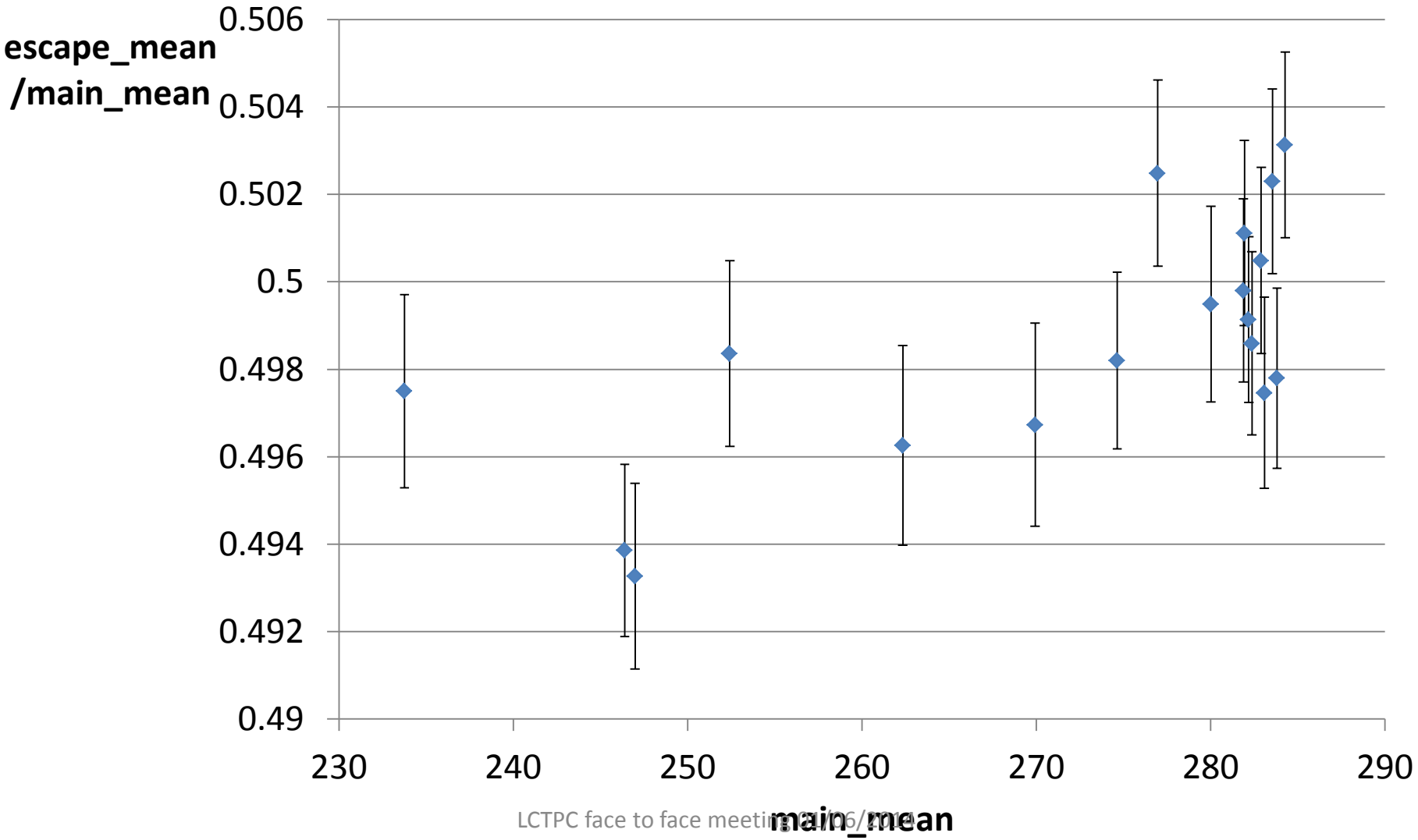


二つのピークの位置の比

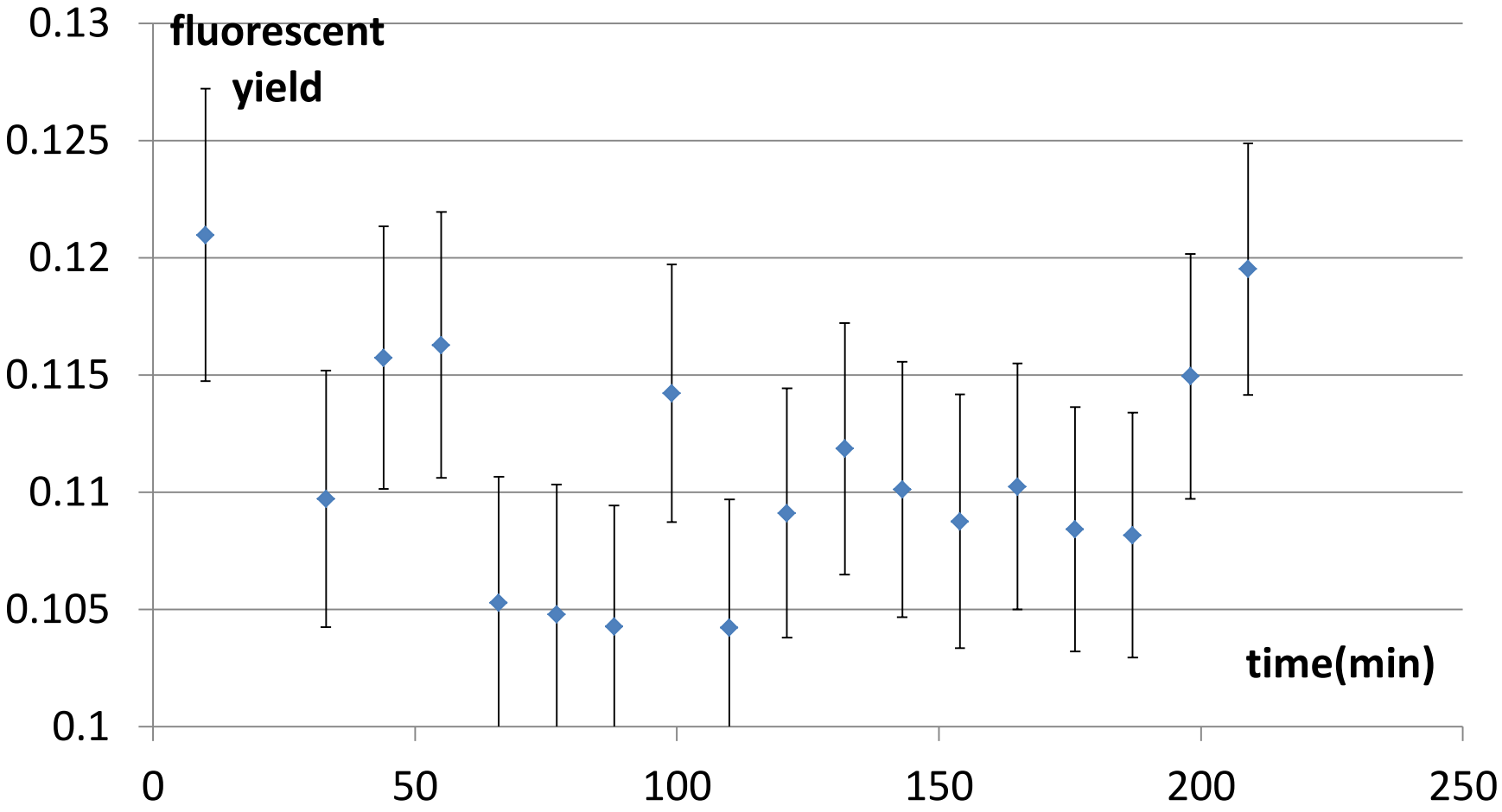



二つのピークの面積比（文献値0.14）
0.14
0.135
0.13
0.125
0.12
0.115
0.11
0.105
0.1
70
90
110
130
150
170
190
210
エスケープピーク位置

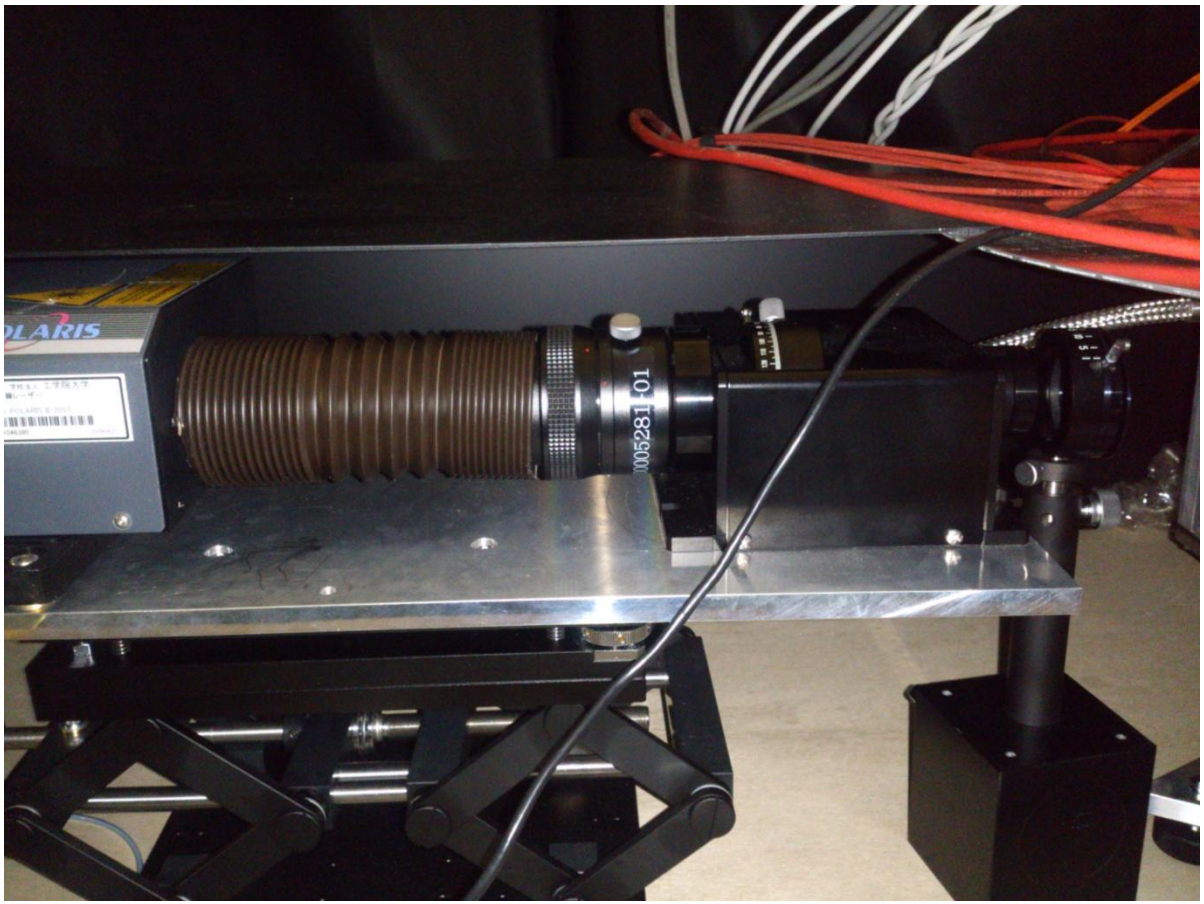
二つのガウスピークの位置の比(9/9)



蛍光収率(9/9)


fluorescent yield
0.13
0.125
0.12
0.115
0.11
0.105
0.1
0
50
100
150
200
250
time(min)

光学機器



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aser(polaris).pdf

レーザビームエキ

バリアブルアッ-

外線透過可視吸

虹彩絞りホル