

Estimate start HV

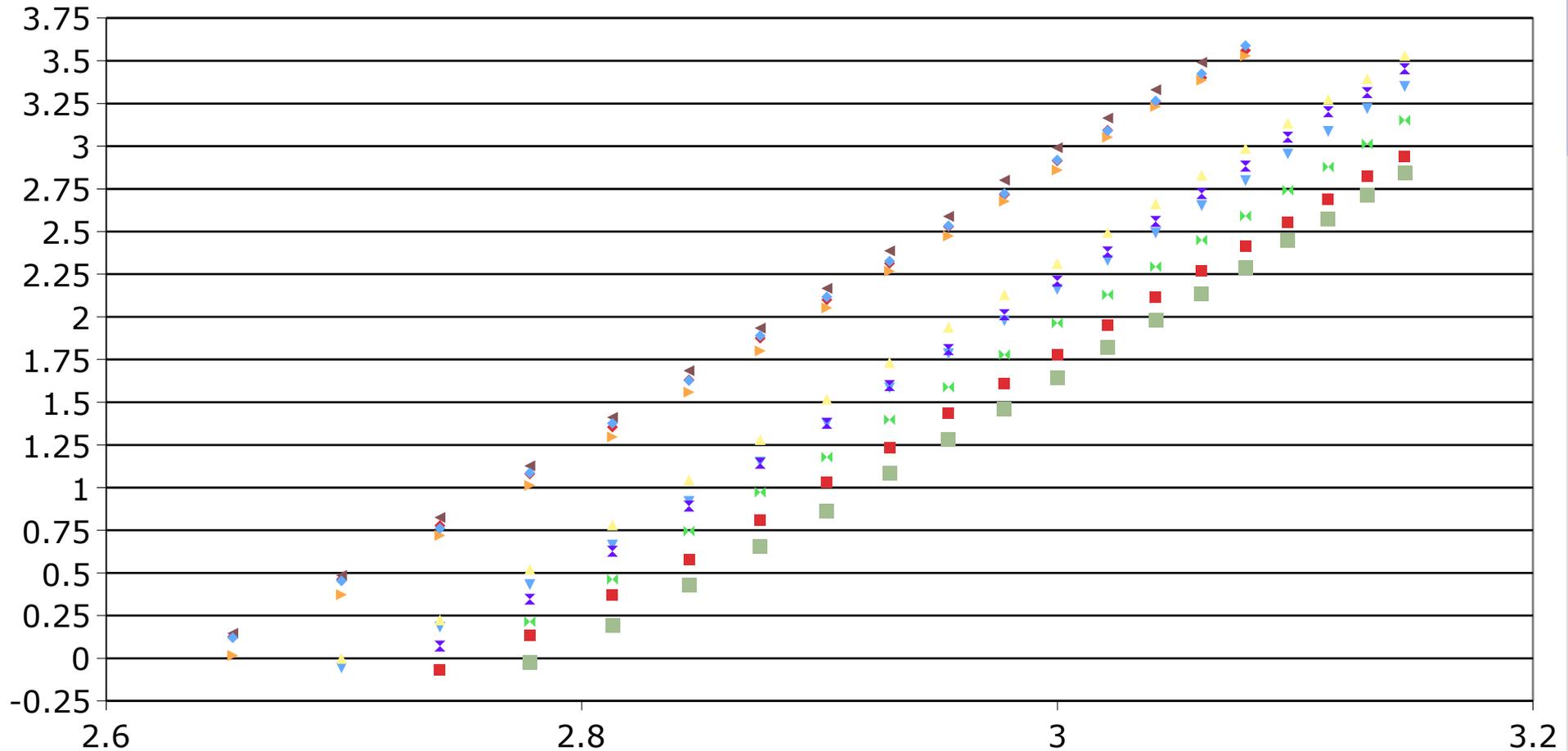
We can use
the data about PMT gain
which was measured by LED and oscilloscope
and the data about MIP
which was measured by cosmic ray,
oscilloscope and actual FEM.

supposition

- It's good if mean of Actual RP pulse comes in 1000 ch on ADC (low gain).
- The pulse is equivalent to 200MIP.
- Width of LED pulse is half of MIP.

Log Gain Curve of Tube 0-9

Log PMT Pulse Height (mV)

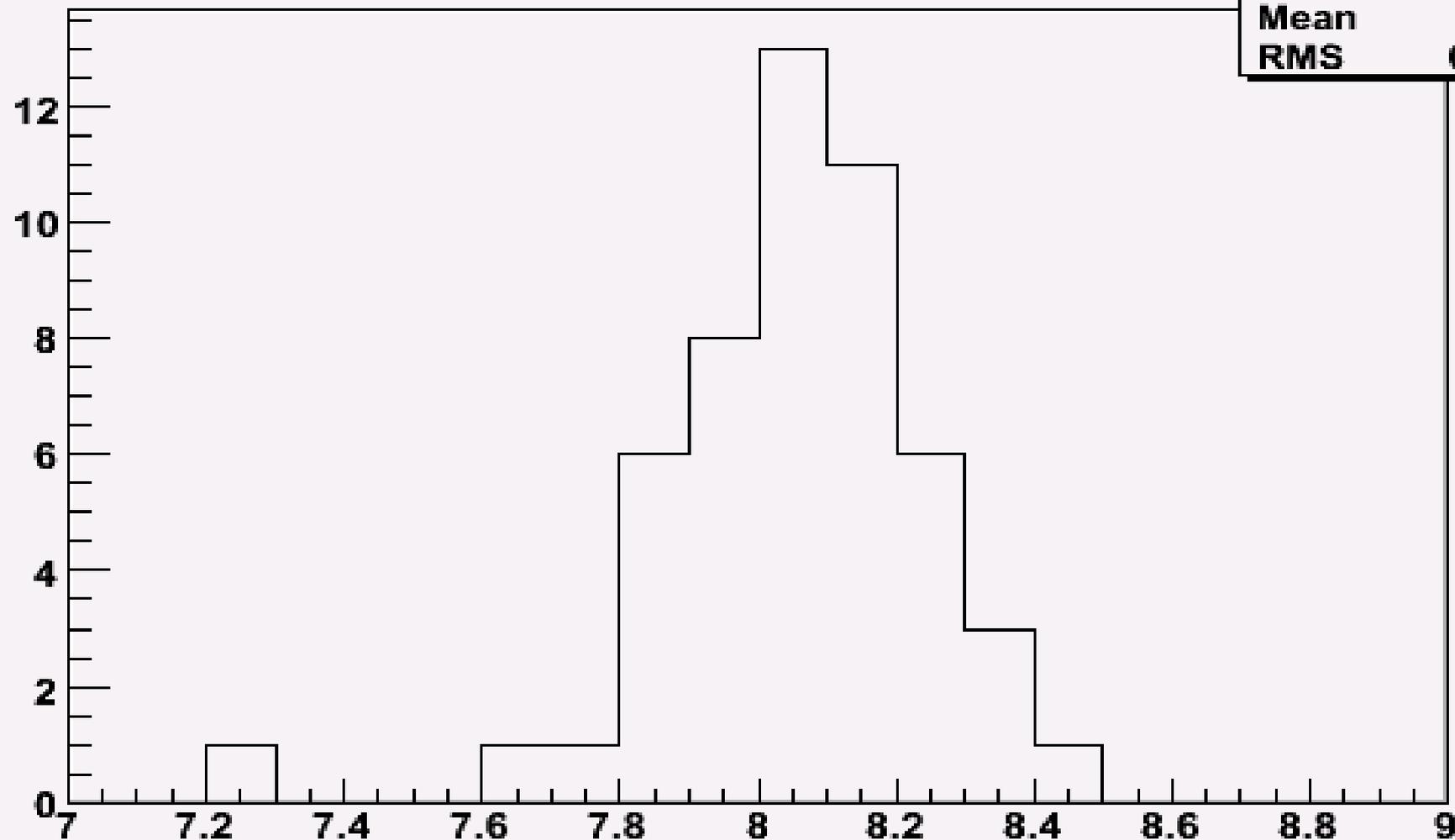


Log Voltage Applied to PMT (V)

- Log Tube 0
- Log Tube 1
- Log Tube 2
- Log Tube 3
- Log Tube 4
- Log Tube 5
- Log Tube 6
- Log Tube 7
- Log Tube 8
- Log Tube 9

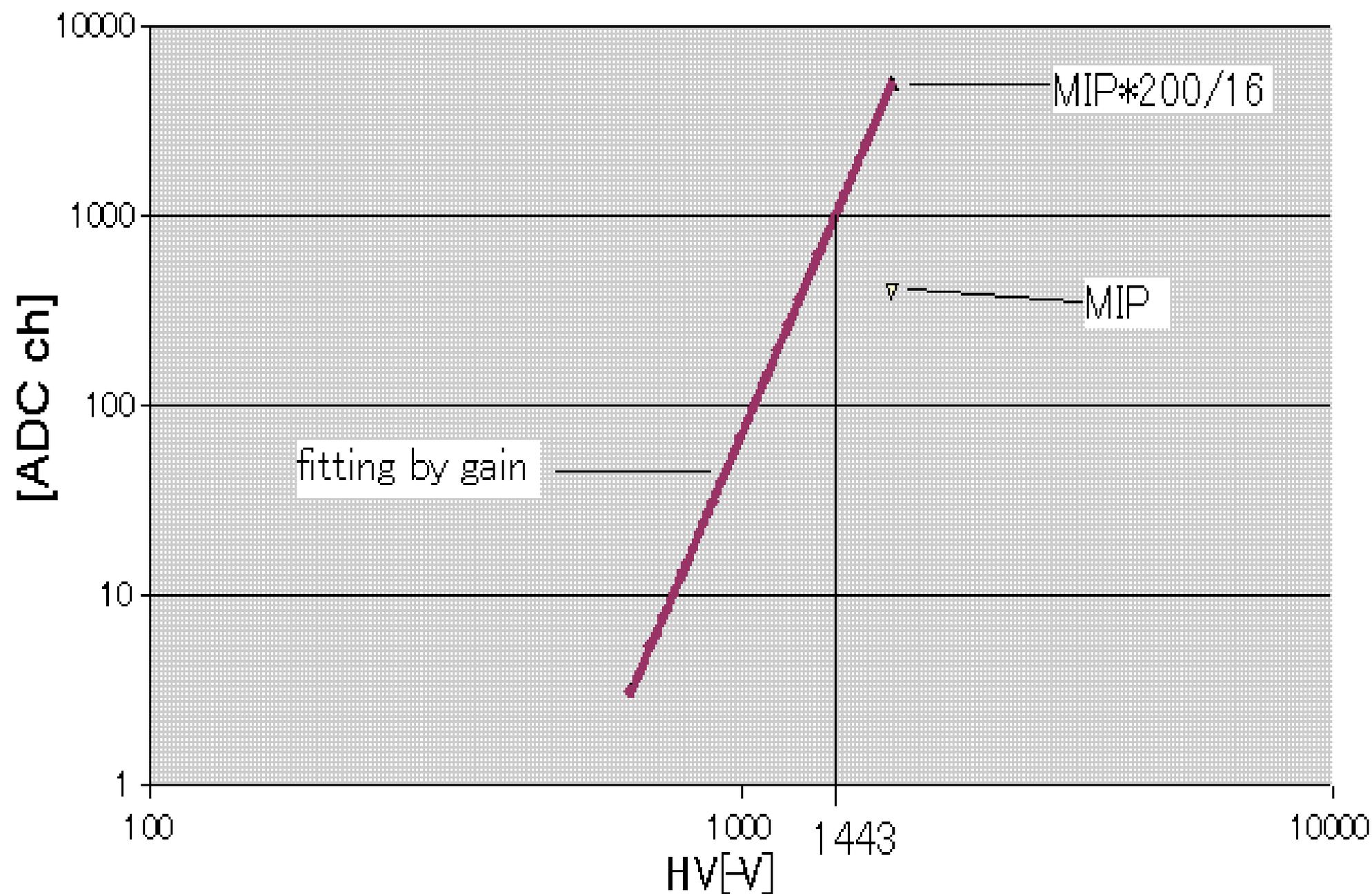
PMT gain slope (Δ LED pulse / Δ HV)

LEDpulse/HV



a	
Entries	52
Mean	8.054
RMS	0.1972

Method 1 (PMT27)



method1

Actual RP pulse is expected $MIP * 200 / 16$.

The gain slope is fitted the point.

Start HV is on 1000ch.

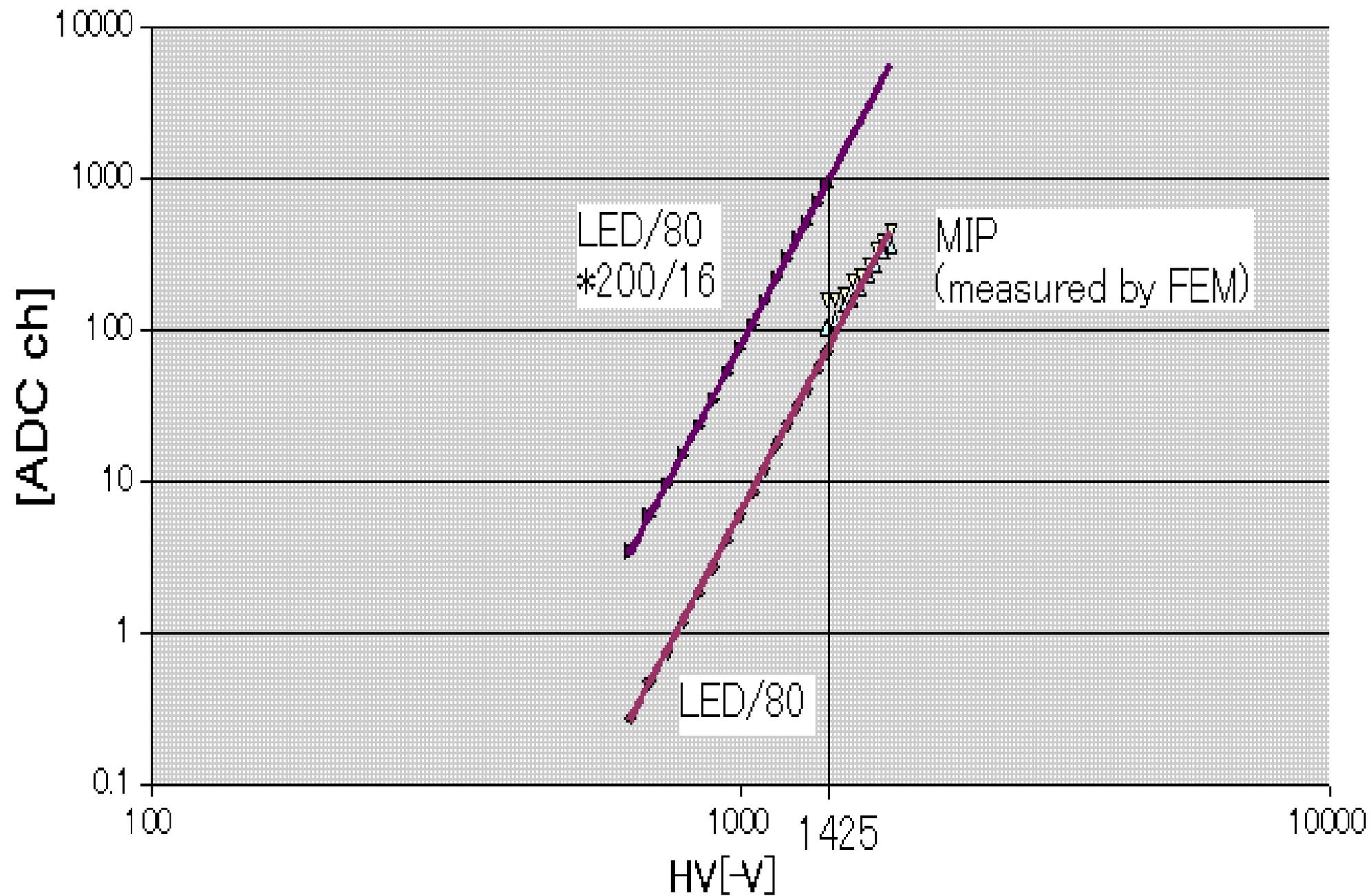
We observed all PMT by oscilloscope
but only PMT27 by FEM.

MIP is 400ch on FEM

and -11.7mV on oscilloscope on PMT27.

The oscilloscope data is used
after exchanged from [mV] to [ADC ch]
for all PMTs in method1.

Method 2 (PMT27)



Method2

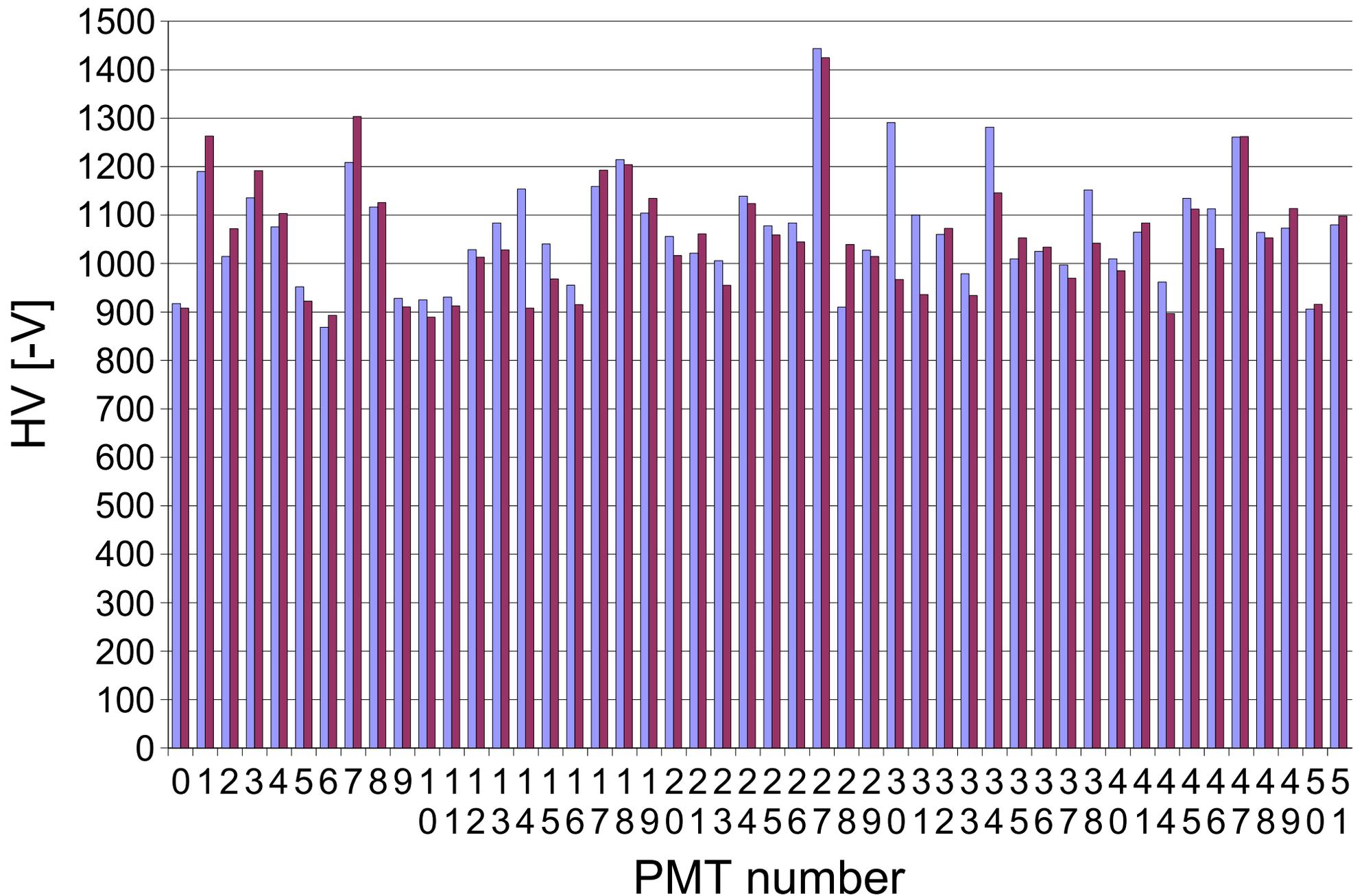
The LED data is exchanged
from [mV] to [ADC ch].

(Width of LED pulse is half of MIP)

It seems that LED pulse = 80MIP.

This rate is used for all PMTs in method2.

start HV (blue=method1, red=method2)



another estimate for start HV

200MIP comes on 1000ch (ADC low gain) in method1, 2.

I exchanged between MIP height and ADC_channel by the data measured by oscilloscope and by FEM.

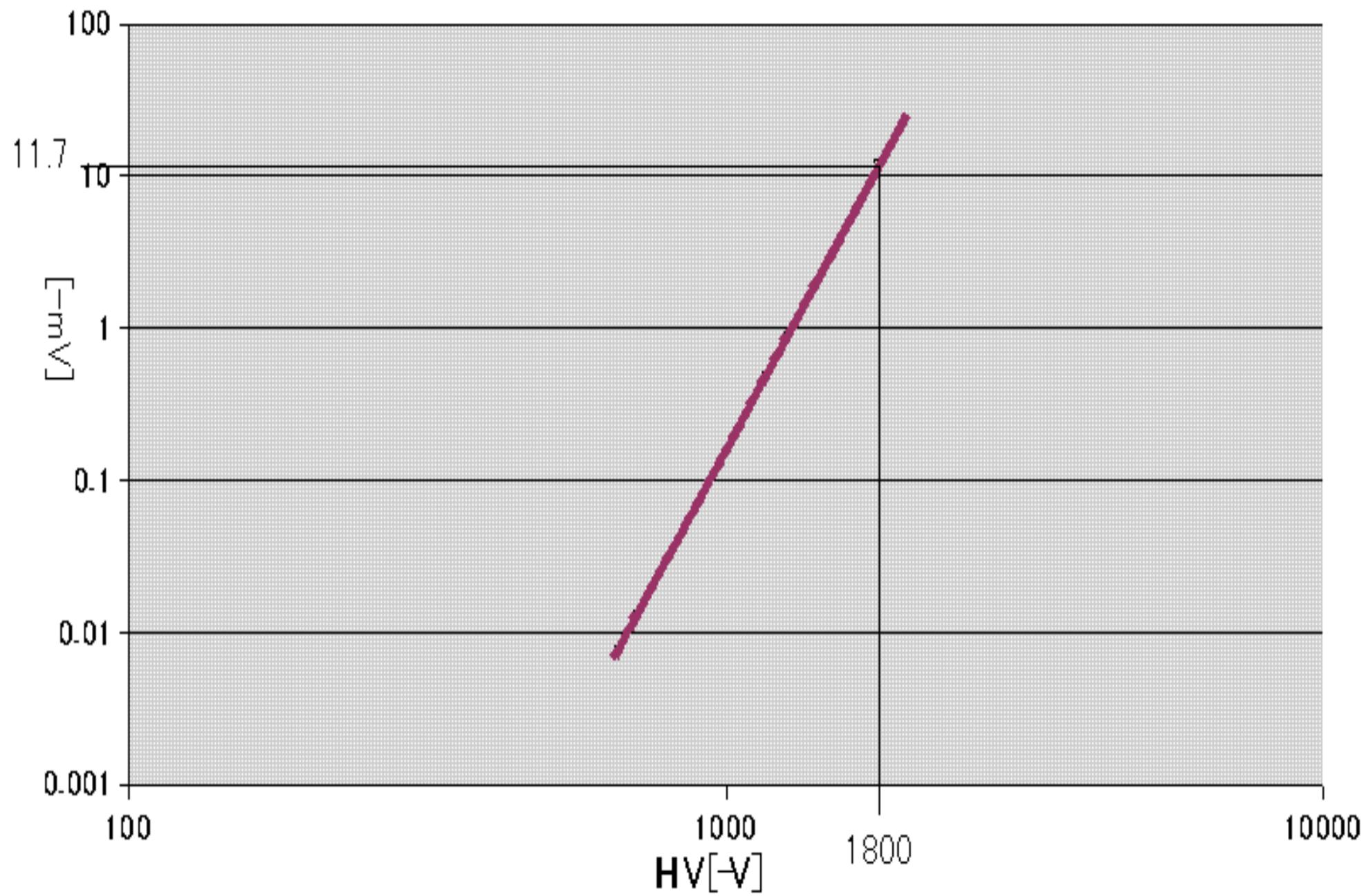
400MIP comes on max range (512pC) follow method3.

I exchanged between MIP height and ADC_charge by " $q=It=Vt/R$ ".

Method 3 condition

- Max number of MIP in Au-Au = 340/PMT
- Max range of FEM is 512pC.
- $q = Vt/R$
512/400 = 1.3pC/MIP $R = 50 \Omega$ $t = 20\text{ns}$
 $V = 3.2\text{mV/MIP}$

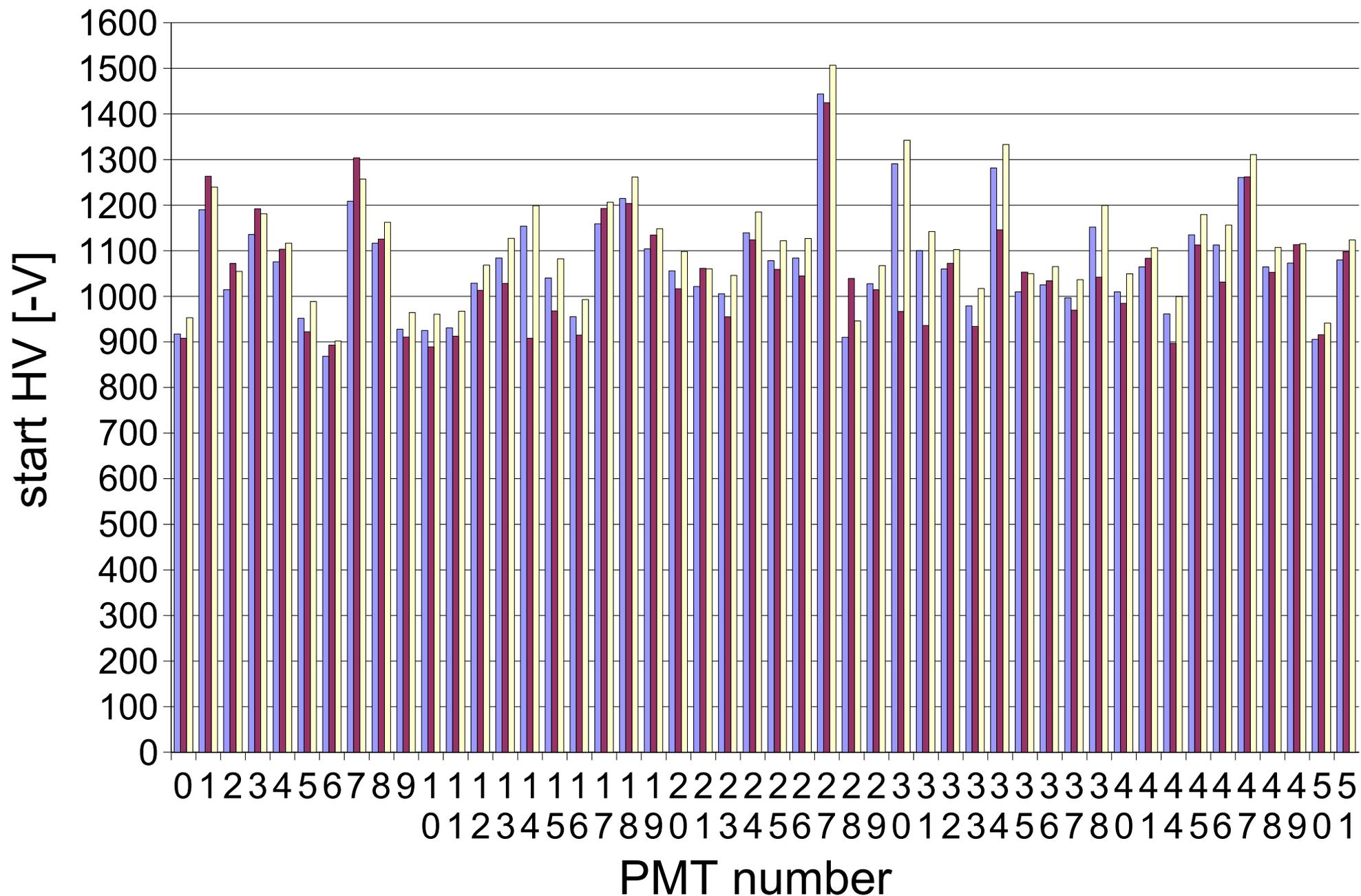
PMT27



Method 3 PMT27

The MIP $11.7[-\text{mV}]/1800[-\text{V}]$
was measured by oscilloscope.
The gain slope was fitted on the MIP.
And read HV on -3.2mV of MIP.

method 1:blue, 2:red, 3:yellow

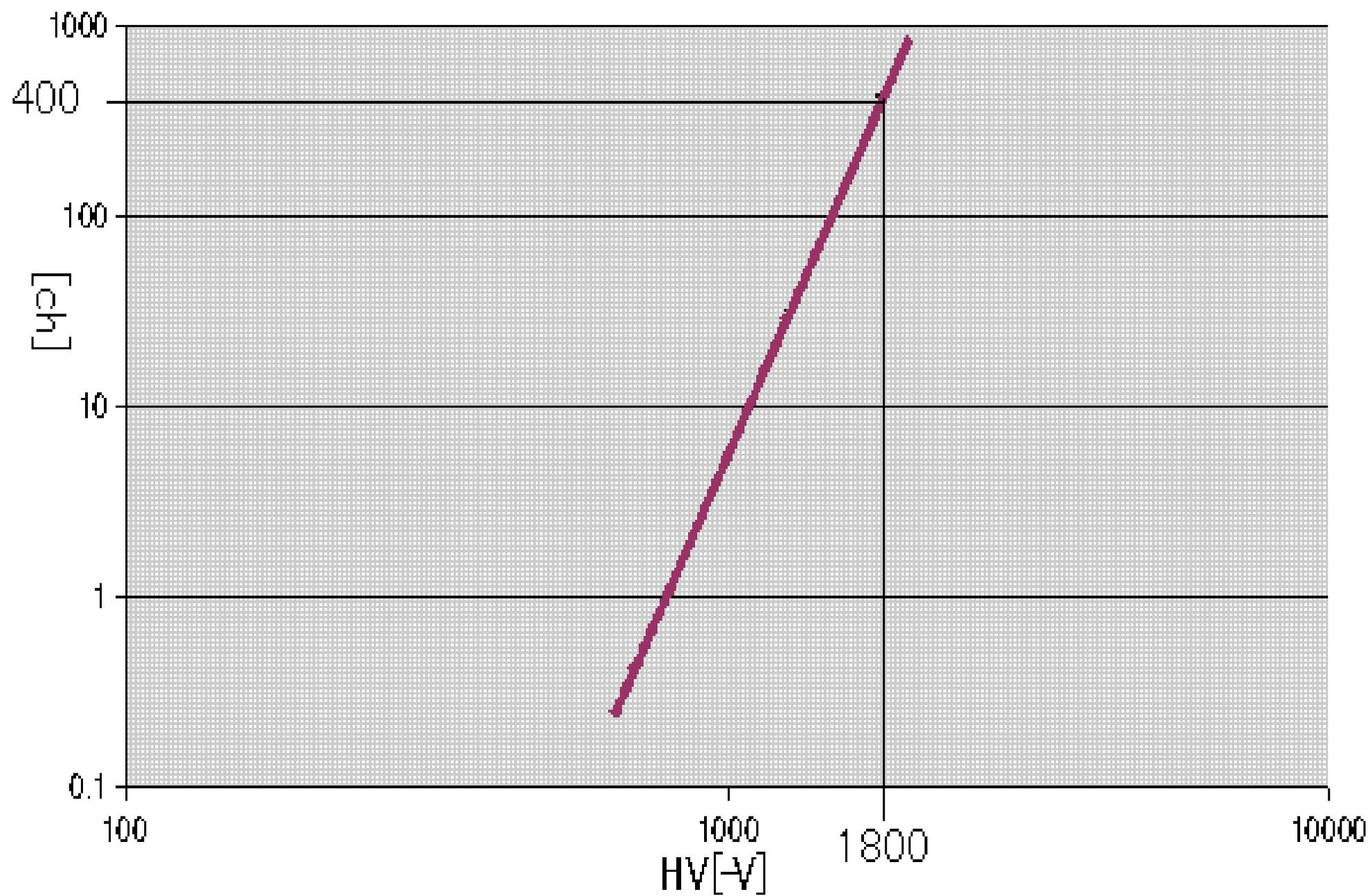


Method for p- p condition

- Max FEM range =4000ch
- Initial particle number/PMT =1
- \rightarrow 4 MIPs due to the converter.
- Fluctuation is $\sqrt{n}=2$
- $4000\text{ADCch} / (4+2) = 700\text{ADCch}/\text{MIP}$

PMT27

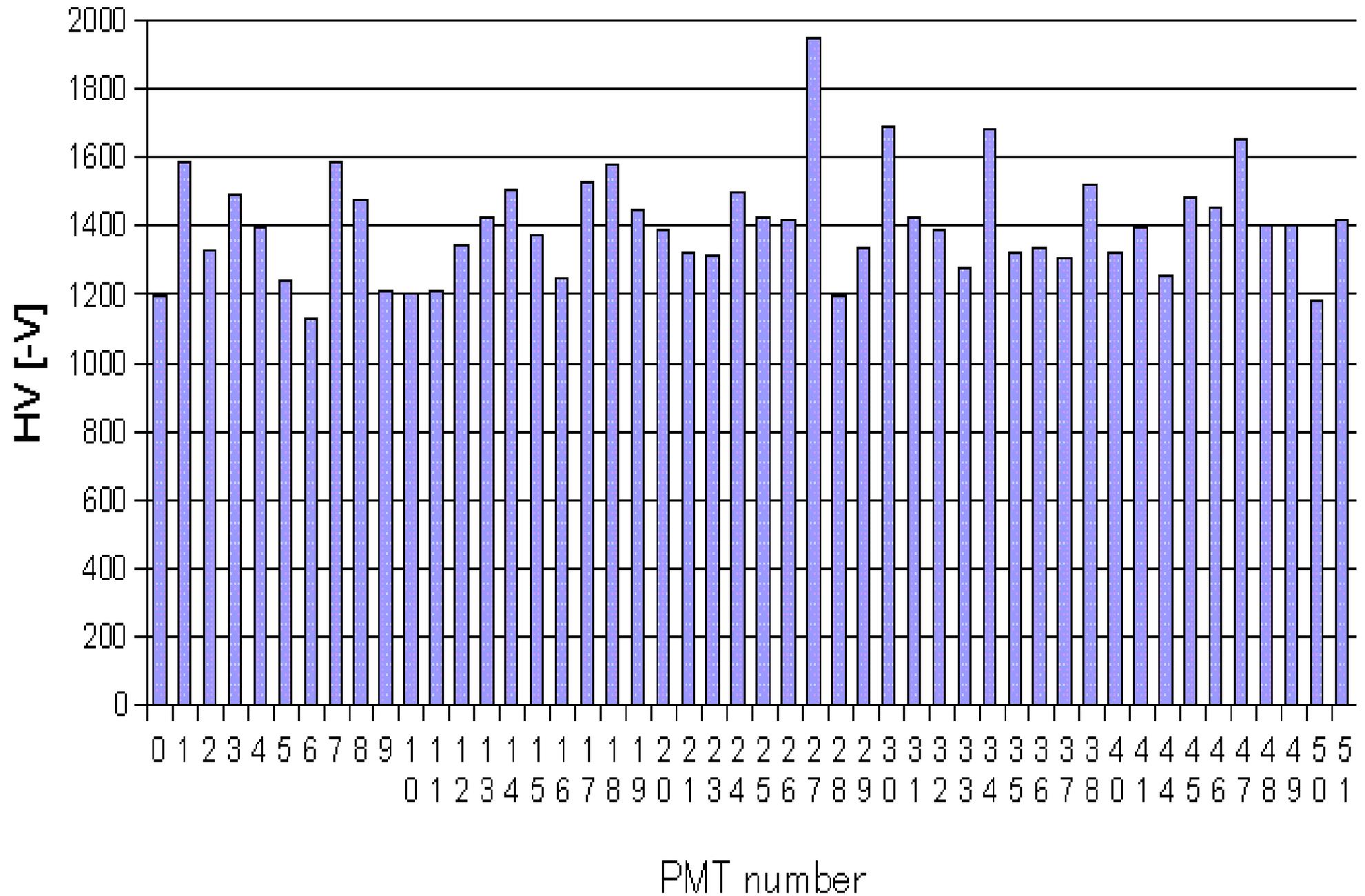
MIP on ADC high gain mode



Method for p- p

The MIP was exchanged to
400[ADCch]/1800[-V] for p-p run
The gain slope was fitted on the MIP.
And read HV on 700ch of MIP.
It is 1944V on PMT27.

start HV for pp



summary

Start HV was estimated
for Au-Au by three methods
and for p-p by one method.
I don't know which method is better.
We had better use lower value
on each PMT.

another estimate for start HV

200MIP comes on 1000ch (ADC low gain) in method1, 2.

I exchanged between MIP height and ADC_channel by the data measured by oscilloscope and by FEM.

400MIP comes on max range (512pC) follow method3.

I exchanged between MIP height and ADC_charge by " $q=It=Vt/R$ ".