Recent topics from Japan

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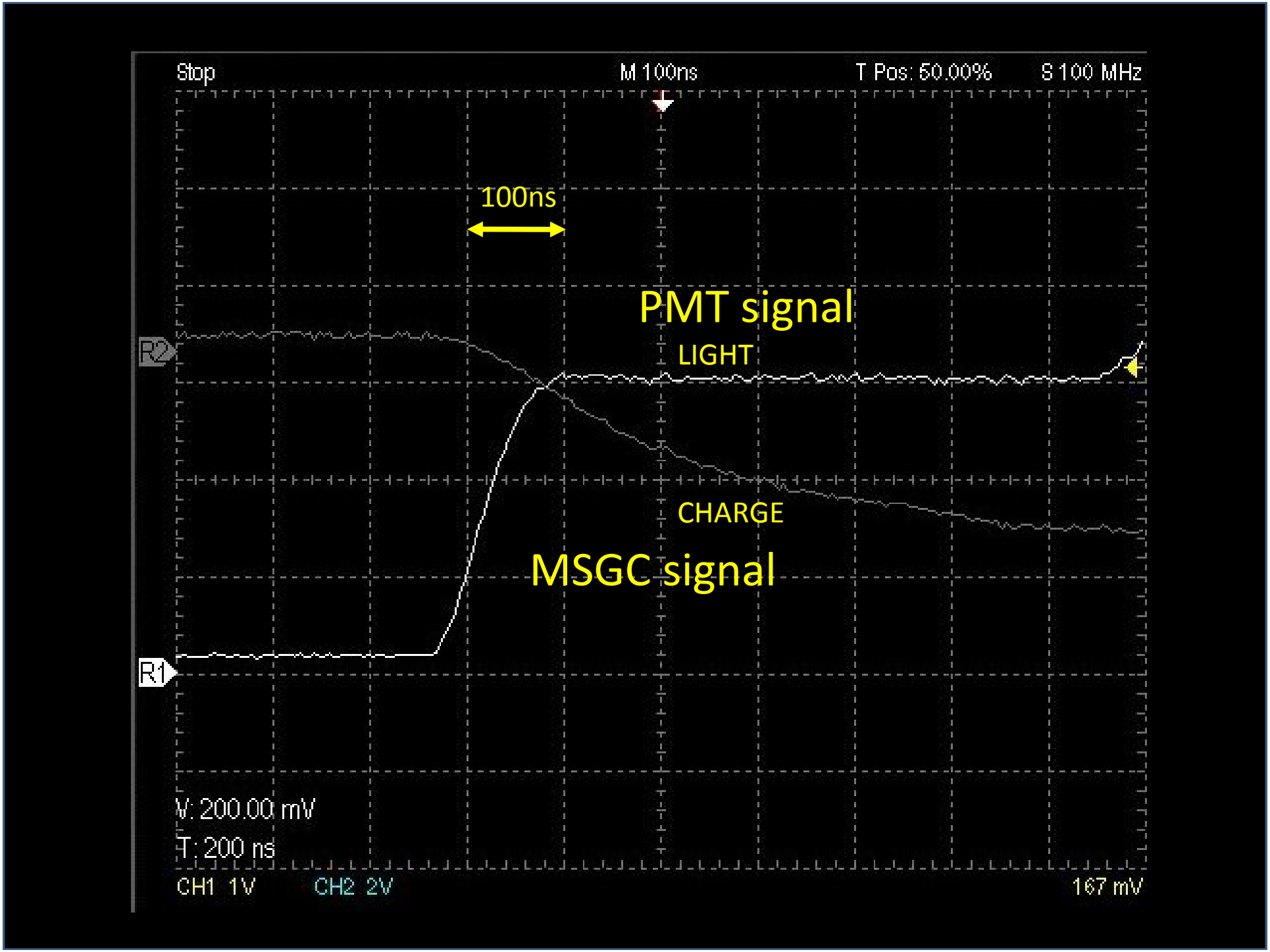
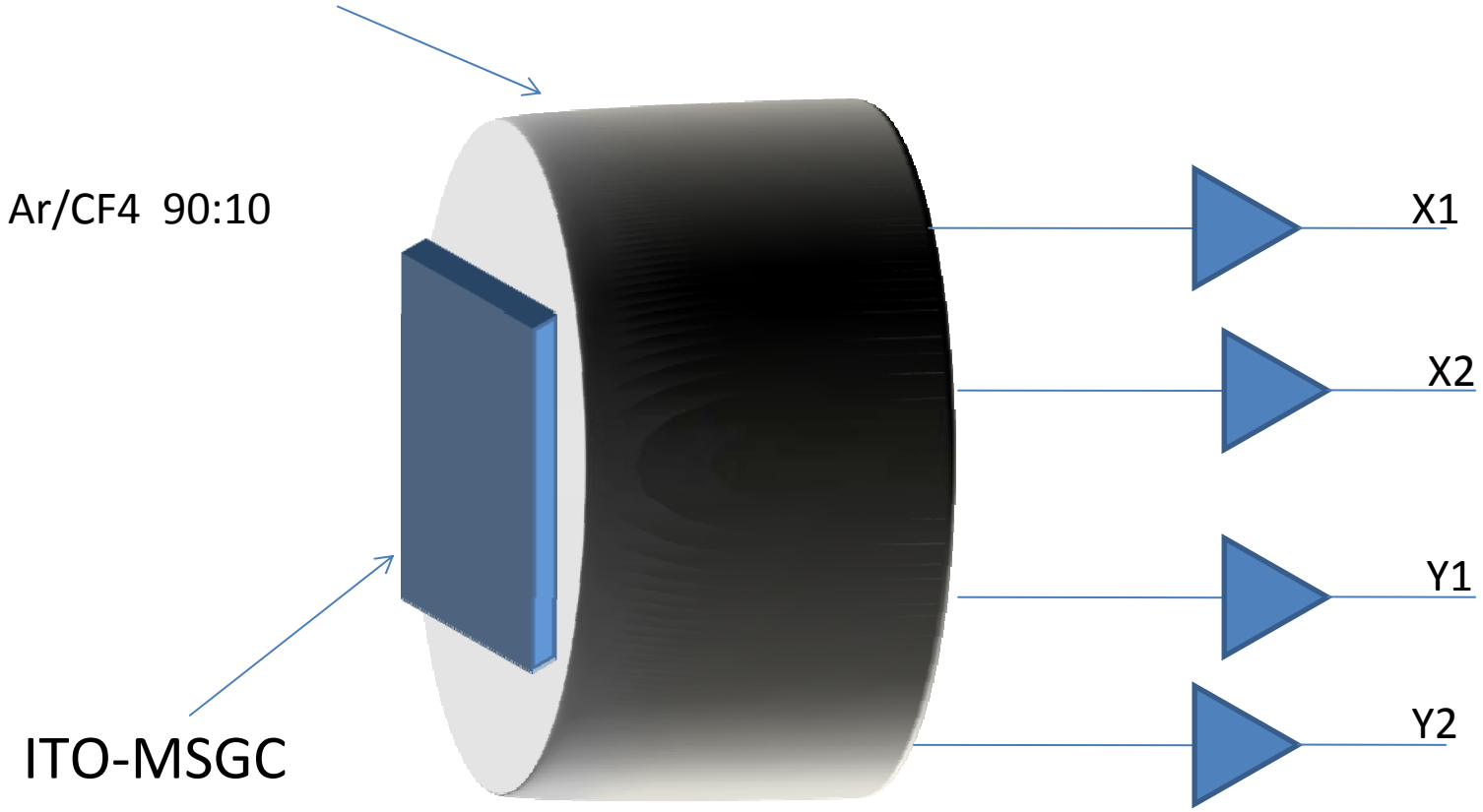
ITO version of M-MSGC


Stop
M 100ns
T Pos: 50.00%
S 100 MHz
100ns
PMT signal
LIGHT
CHARGE
MSGC signal
R2
R1
V: 200.00 mV
T: 200 ns
CH1 1V
CH2 2V
167 mV

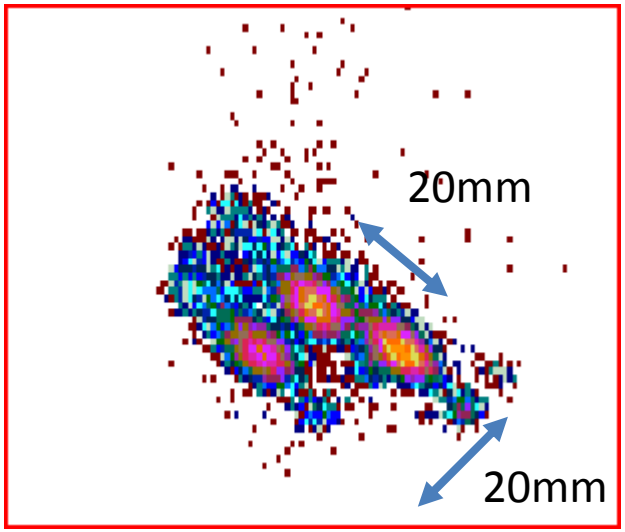
Position measurement

Hamamatsu R2486-02 PSPMT

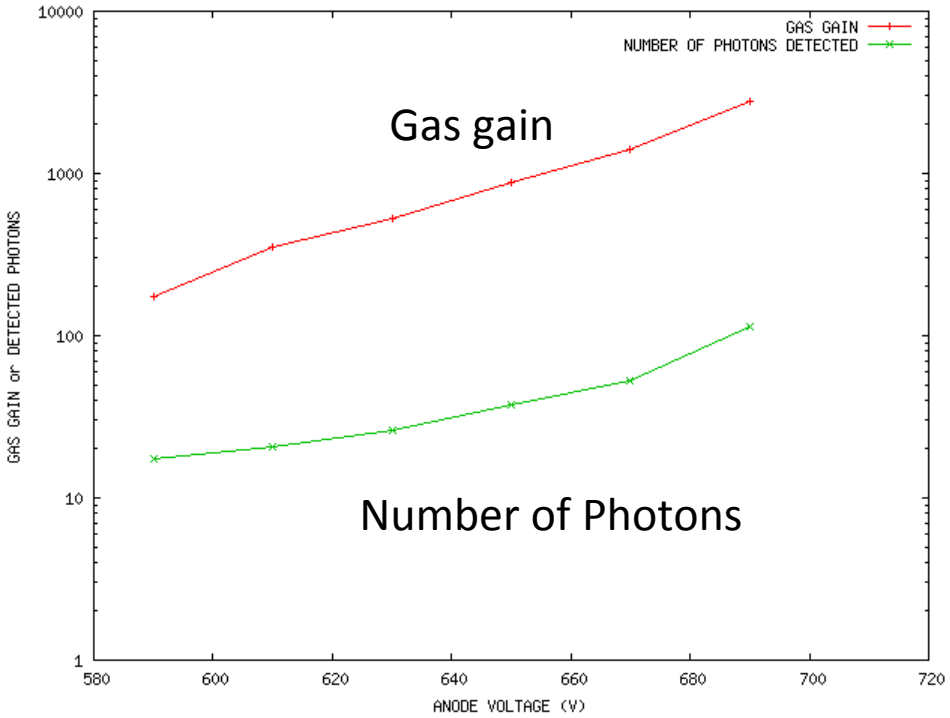


PSPMT measurement

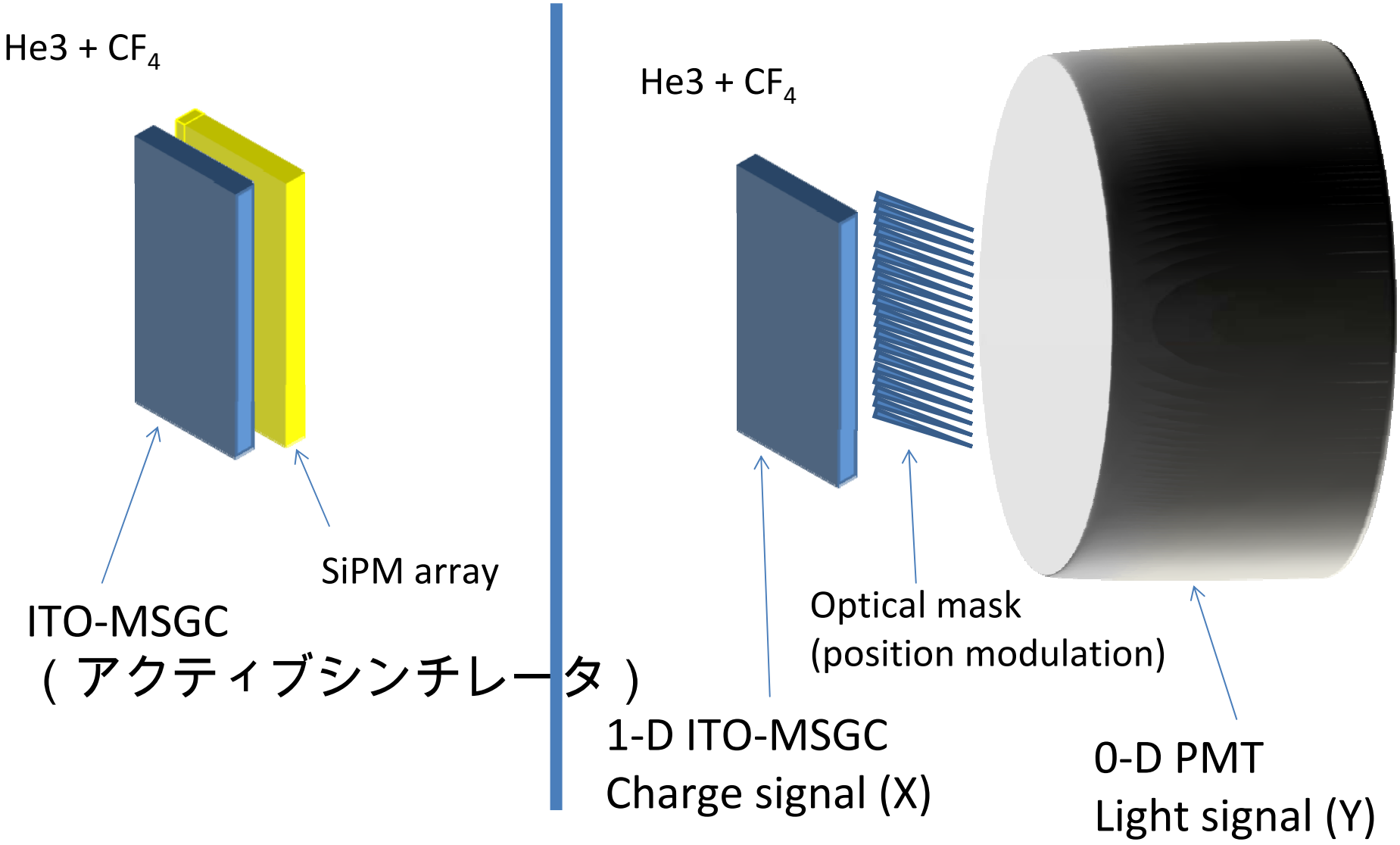
6keV collimated X-ray beam (scanned in 20mm x 20mm area)



PMT gain = ~10^5

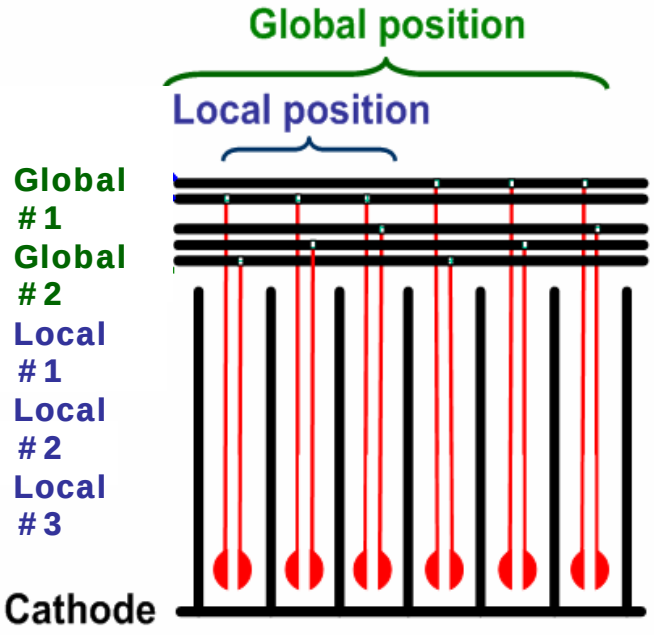


Future plan


He3 + CF_4
He3 + CF_4
SiPM array
ITO-MSGC
（アクティブシンチレータ）
Optical mask
(position modulation)
1-D ITO-MSGC
Charge signal (X)
0-D PMT
Light signal (Y)

The Global-Local Grouping Method

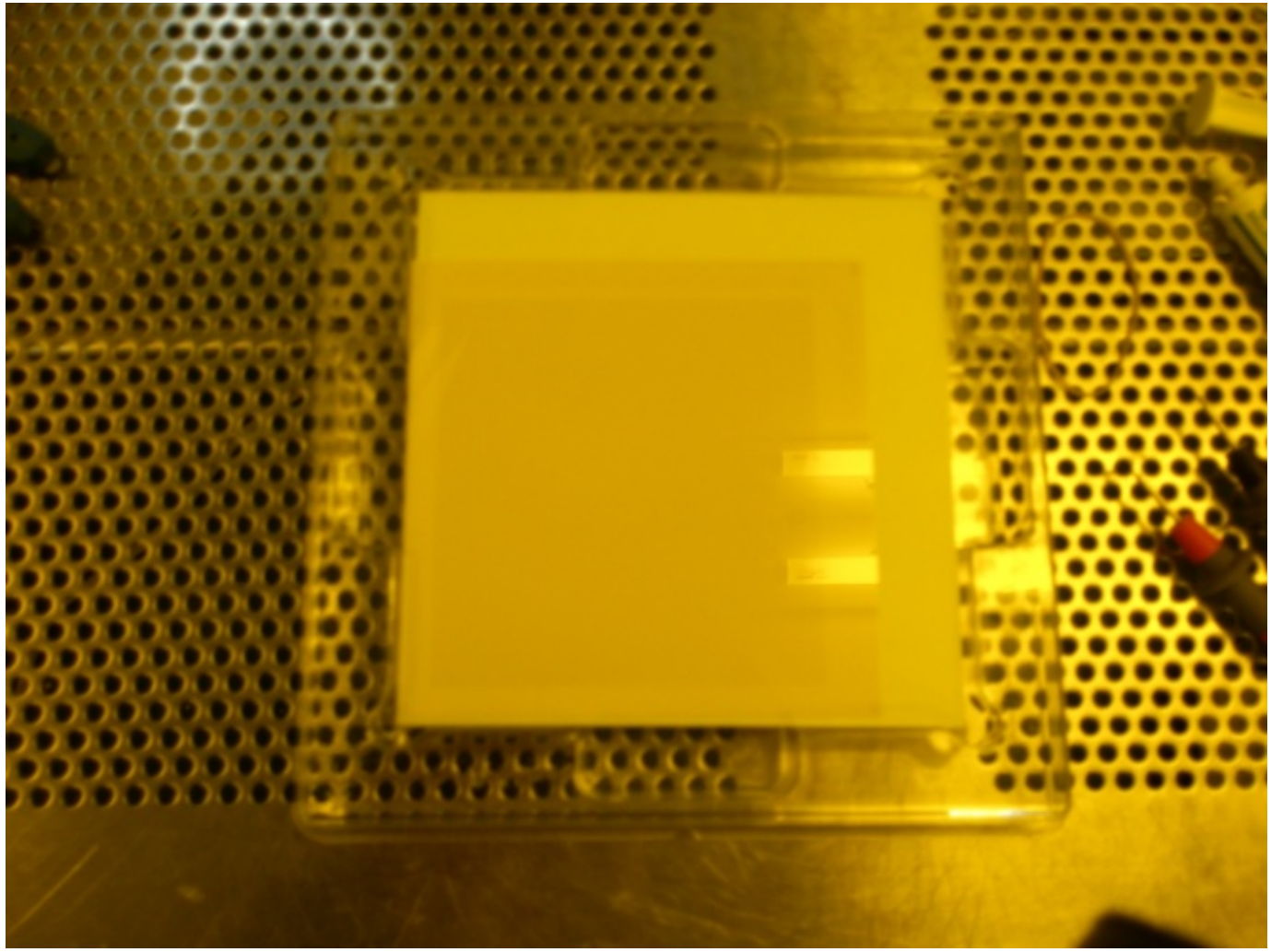
- Signal is divided into two parts (global and local).
- Signal to noise ratio becomes half but the number of total readout lines can be 1/5 (for 81 channels) ~1/10 (for 400 channels).



PRINCIPLE of GLG encoding

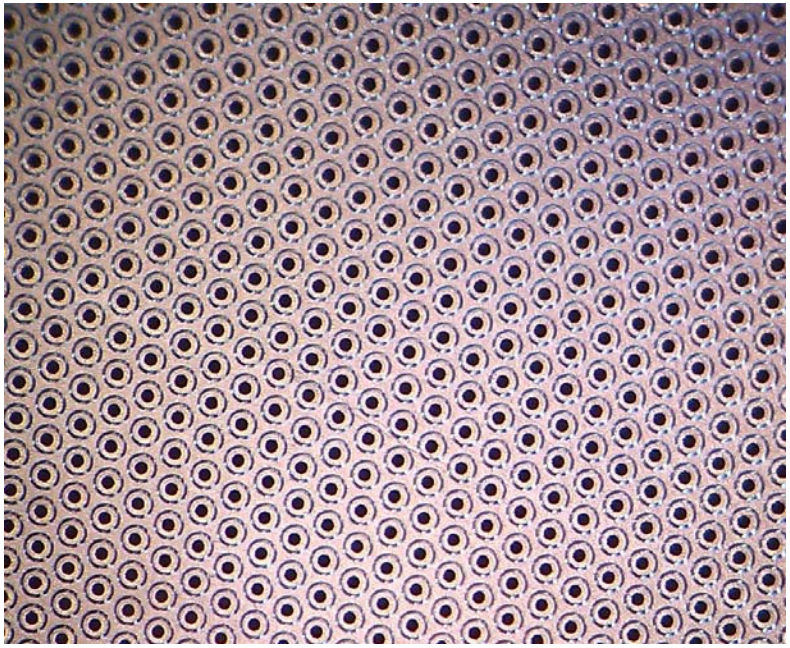
Photo-sensitive glass (HOYA glass)

- Global Local readout
- 0.3mm thick glass / 40um VIA hole with copper VIA



PEG3C（ 150mm×150mm ）

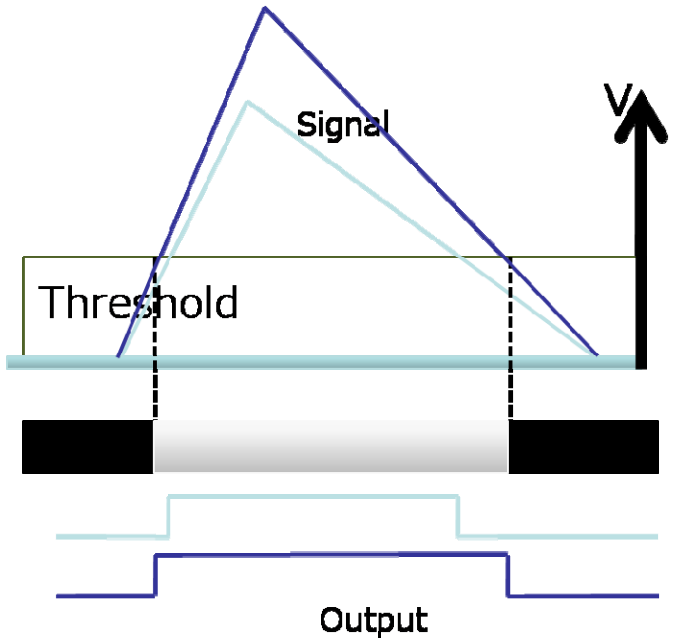
PEG3 MG-GEM



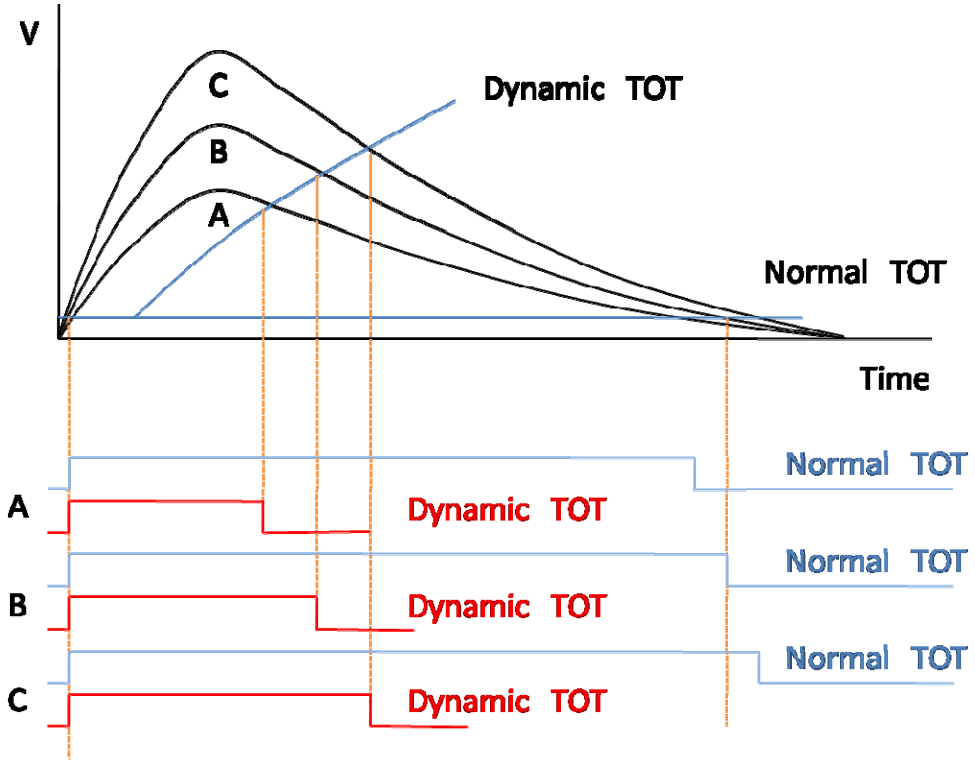
New Time over Threshold scheme

- ToT(Time over Threshold)
  - Simple Analog-to-Digital conversion
  - Suitable for Multichannel system

  - Poor linearity



New Dynamic Time over Threshold (d-ToT) method

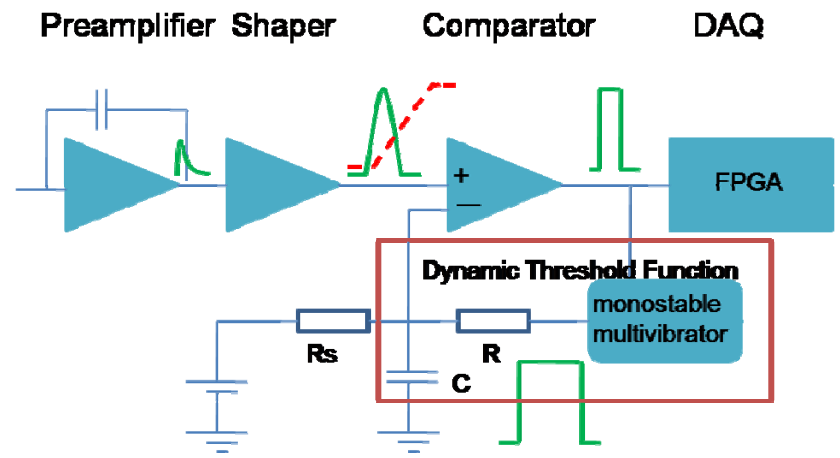


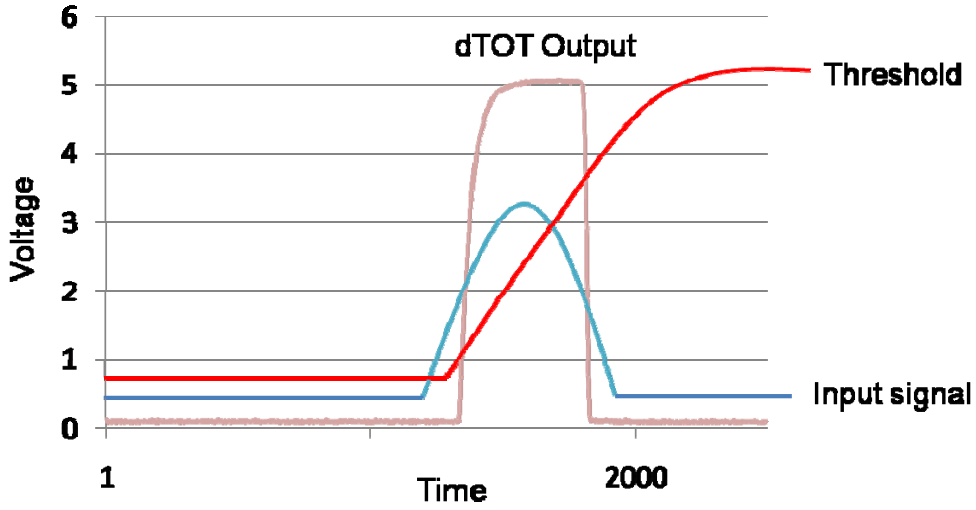
Sweep the threshold voltage

-Shorter pulse width

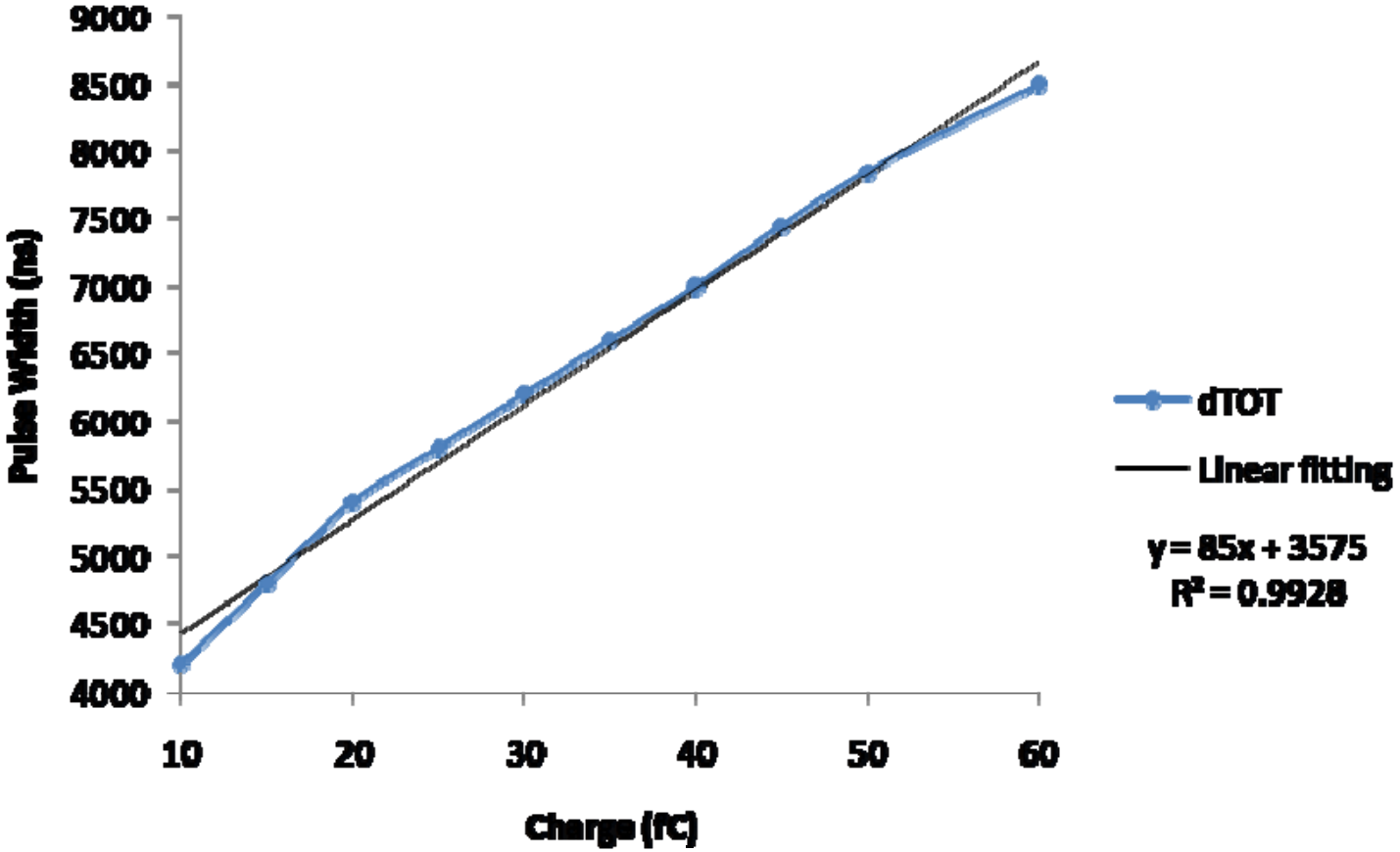
-Better linearity

Implementation of Dynamic ToT





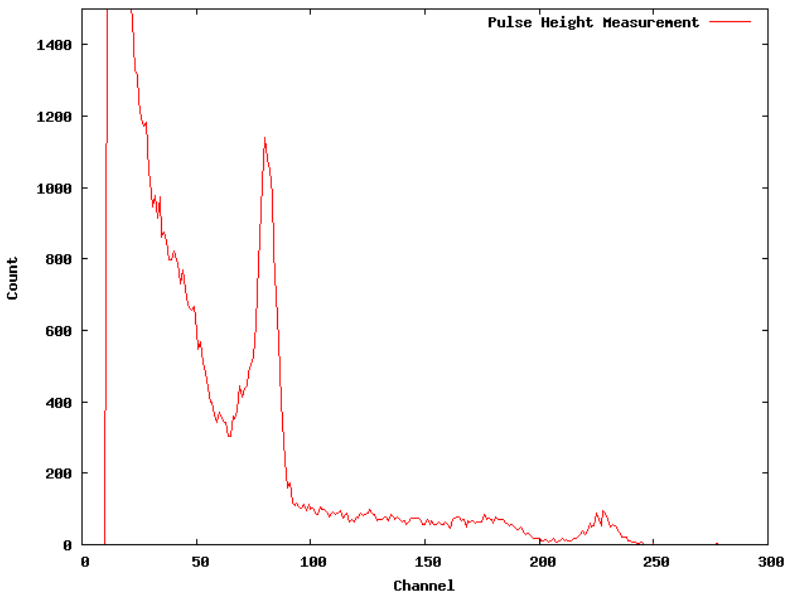
Measured Linearity with d-ToT



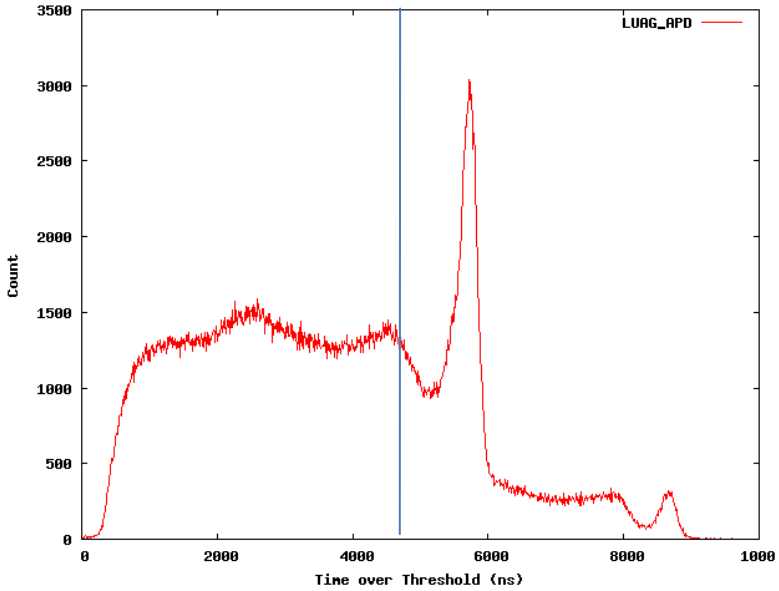
The coefficient of determination (R^2) = 0.9928 INL=4.0%

1. Simple decoding with one pulse
2. Simple reconstruction because of its linearity

Energy spectrum with d-ToT

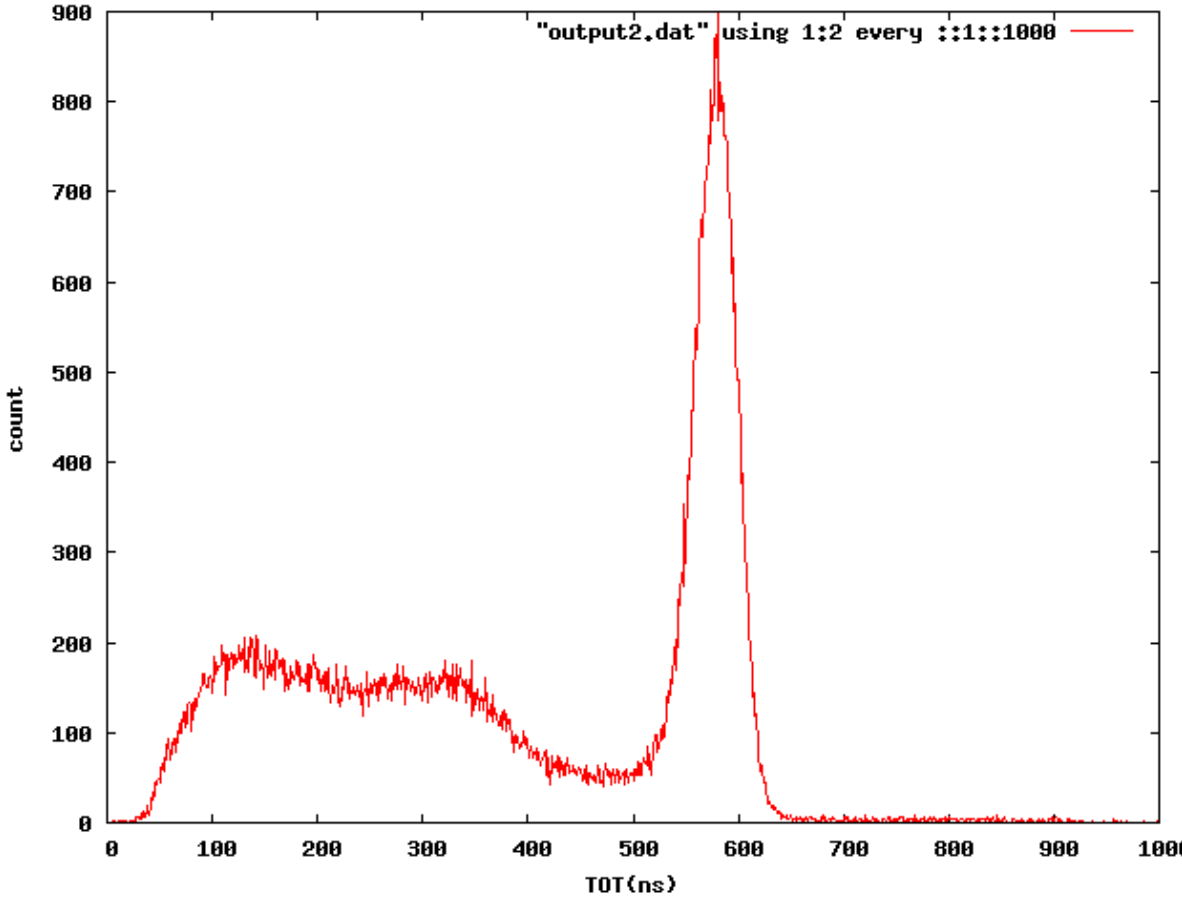


Spectrum with MCA

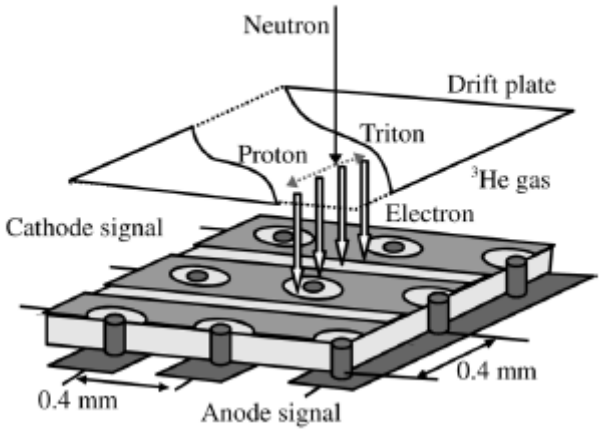


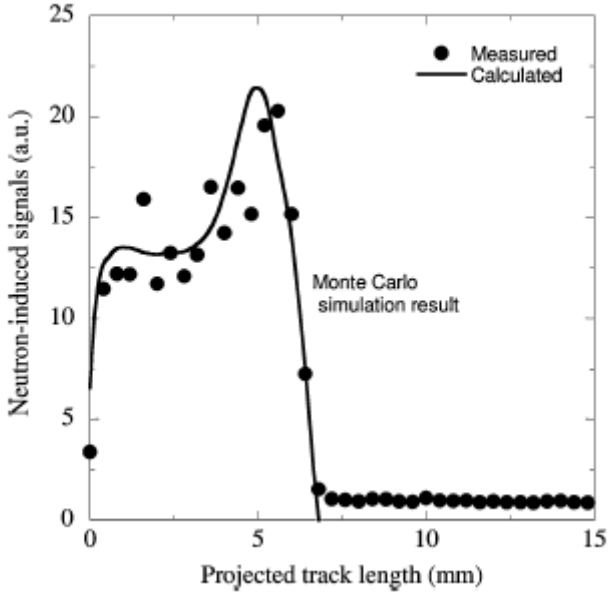
Spectrum with dTOT

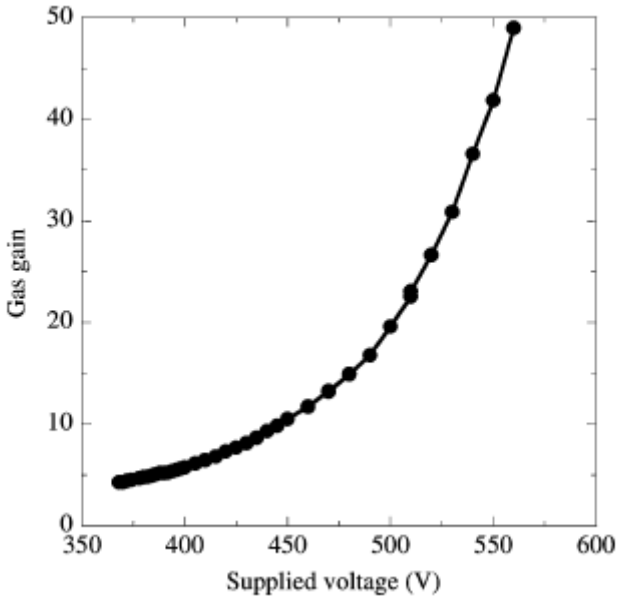
LuAG-APD (3mmx3mmx8mm) ^{22}Na



^{137}Cs 662keV


Neutron
Drift plate
Triton
Proton
^{3}He gas
Electron
Cathode signal
0.4 mm
0.4 mm
Anode signal

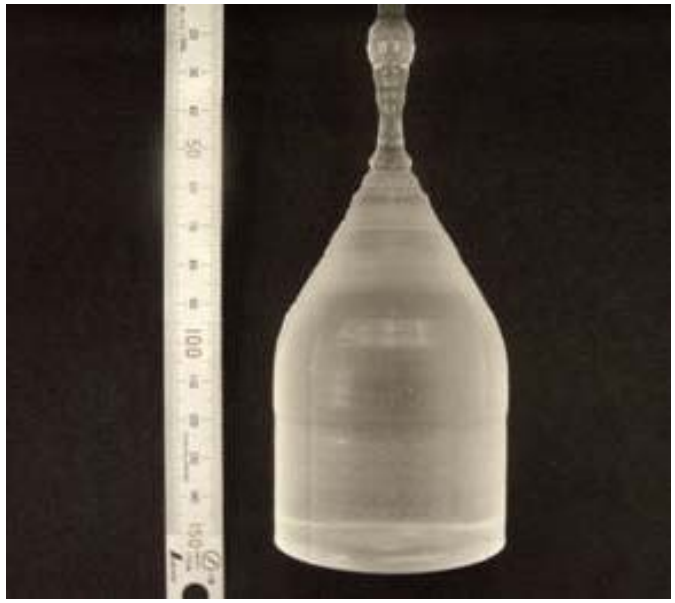

Measured
Calculated
Monte Carlo
simulation result
Neutron-induced signals (a.u.)
Projected track length (mm)
0
5
10
15
20
25


Gas gain
Supplied voltage (V)
0
10
20
30
40
50
350
400
450
500
550
600

Large size 6Li-fluoride single crystals for thermal neutron detection

advantage

- **Low hygroscopic**
- **High transparency**
- **Fast decay time comparing with ZnS(Ag)**
- **Easy to grow large crystals**
  → **low cost**



As-grown 2-inch Eu:LiCAF single crystal.

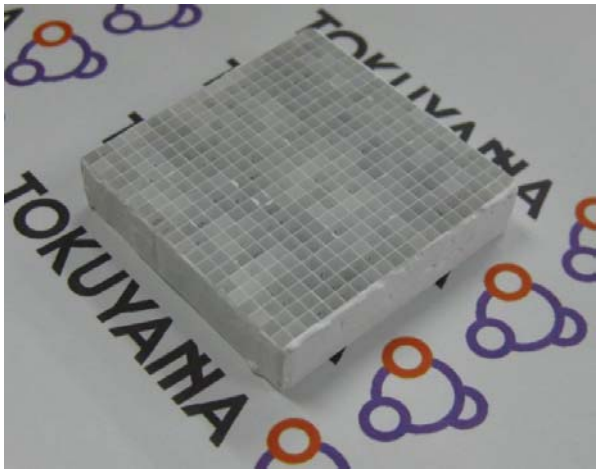
Ce:6LiCaAlF$_6$ (LiCAF)

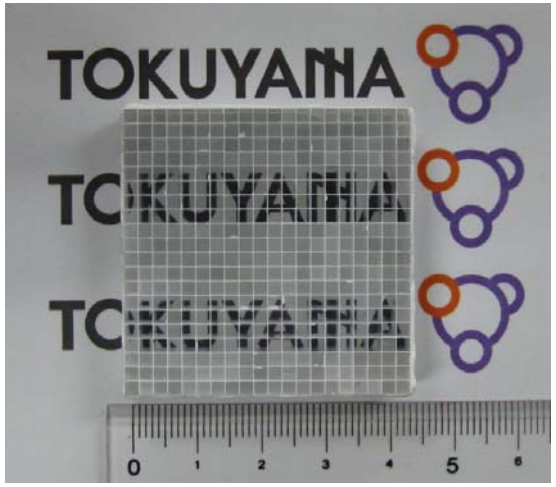
Eu:6LiCaAlF$_6$ (LiCAF)

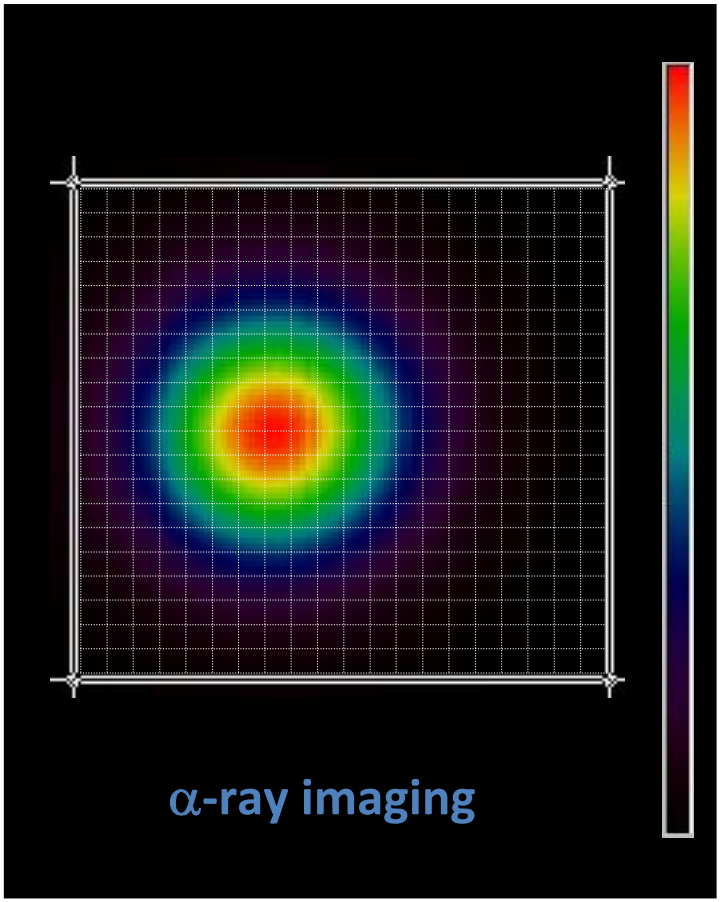
Ce:6LiYF$_4$

were available.

High transparency Eu:6LiCaAlF$_6$ sintillator array







High transparency crystals

Our present results compared with commercial neutron scintillators

Host	Dopant	Hygro-scopy	Trans-parency	Light Yield (photons/ neutron)	Peak emission wavelength (nm)	Decay (ns)
Li-glass GS20	Ce	Low	Good	~ 6000	395	75
LiI	Eu	Huge	Good	50000	470	1400
LiF/ZnS	Ag	Low	Opacity	160000	450	> 1000
LiCAF	**Ce**	**Low**	**Good**	**3000**	**310**	**40**
LiCAF	**Eu**	**Low**	**Good**	**10000~**	**370**	**1600**