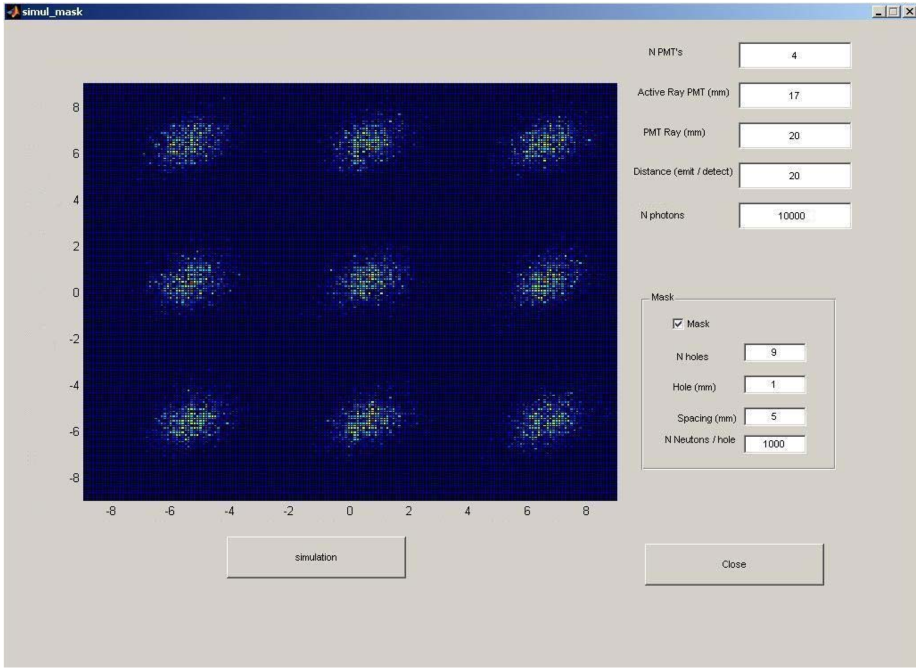
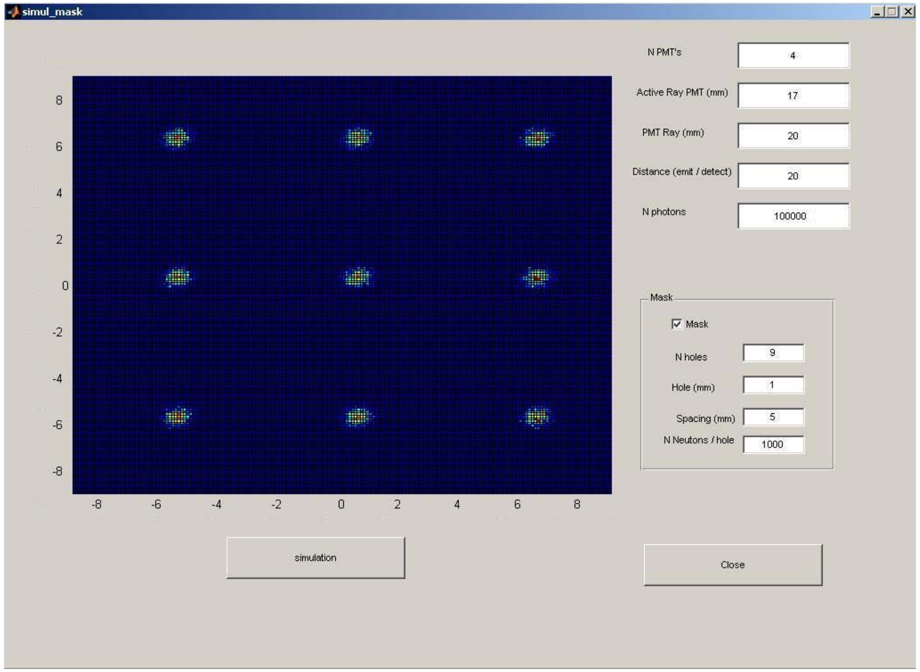
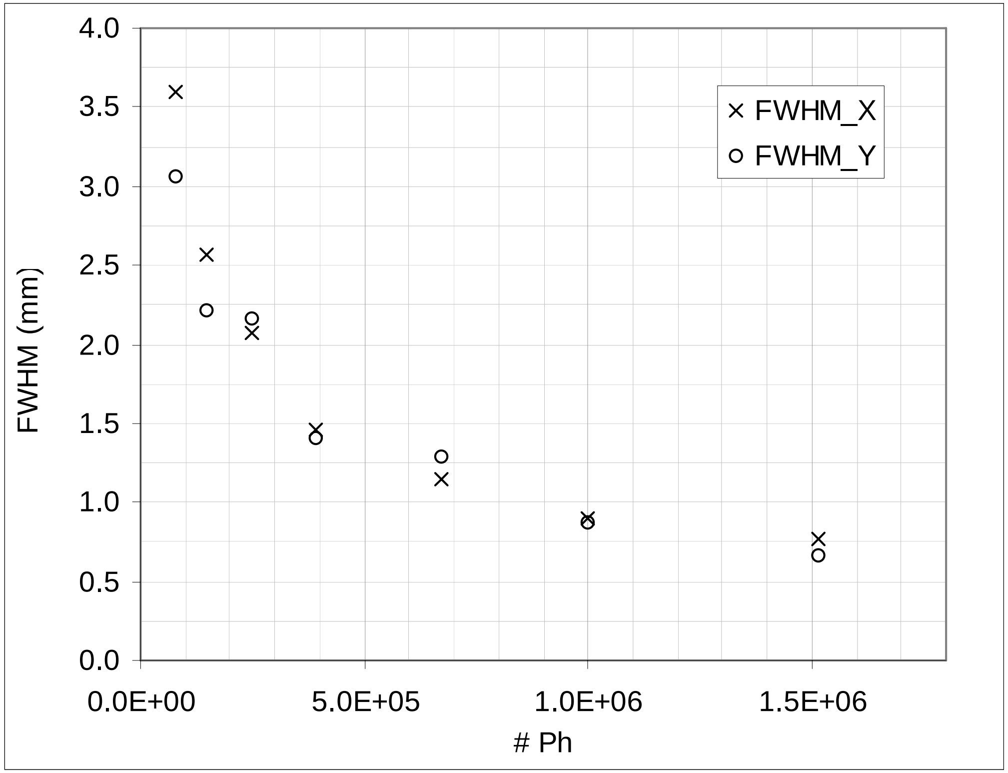
Simulations

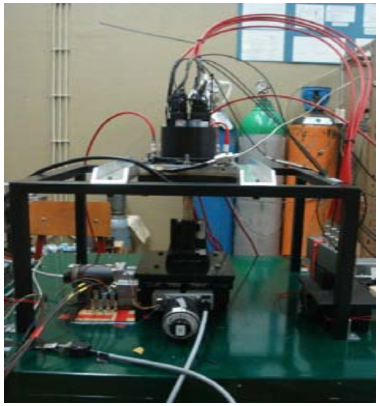




~5x 10^5 photons are needed for 1 mm resolution

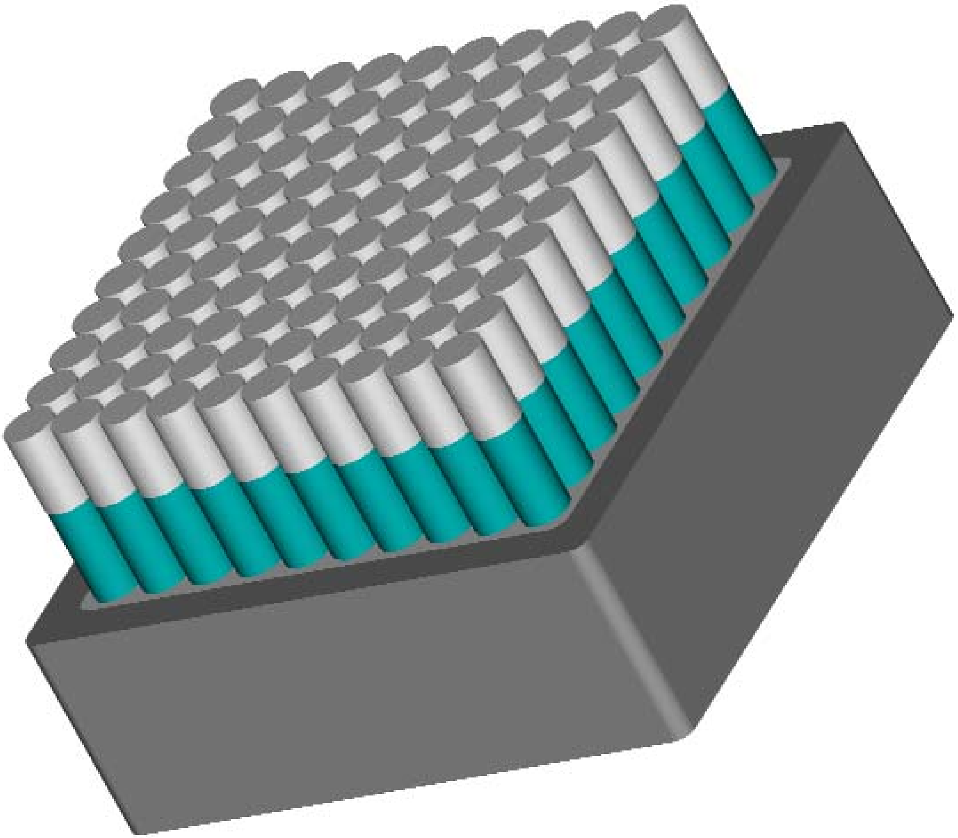
Position resolution versus number of emitted photons

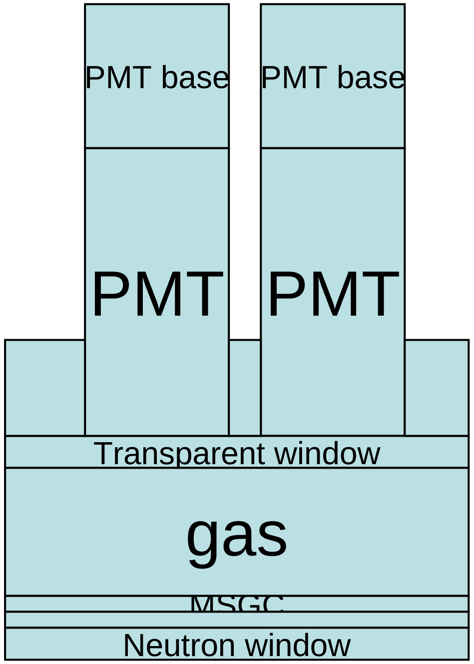


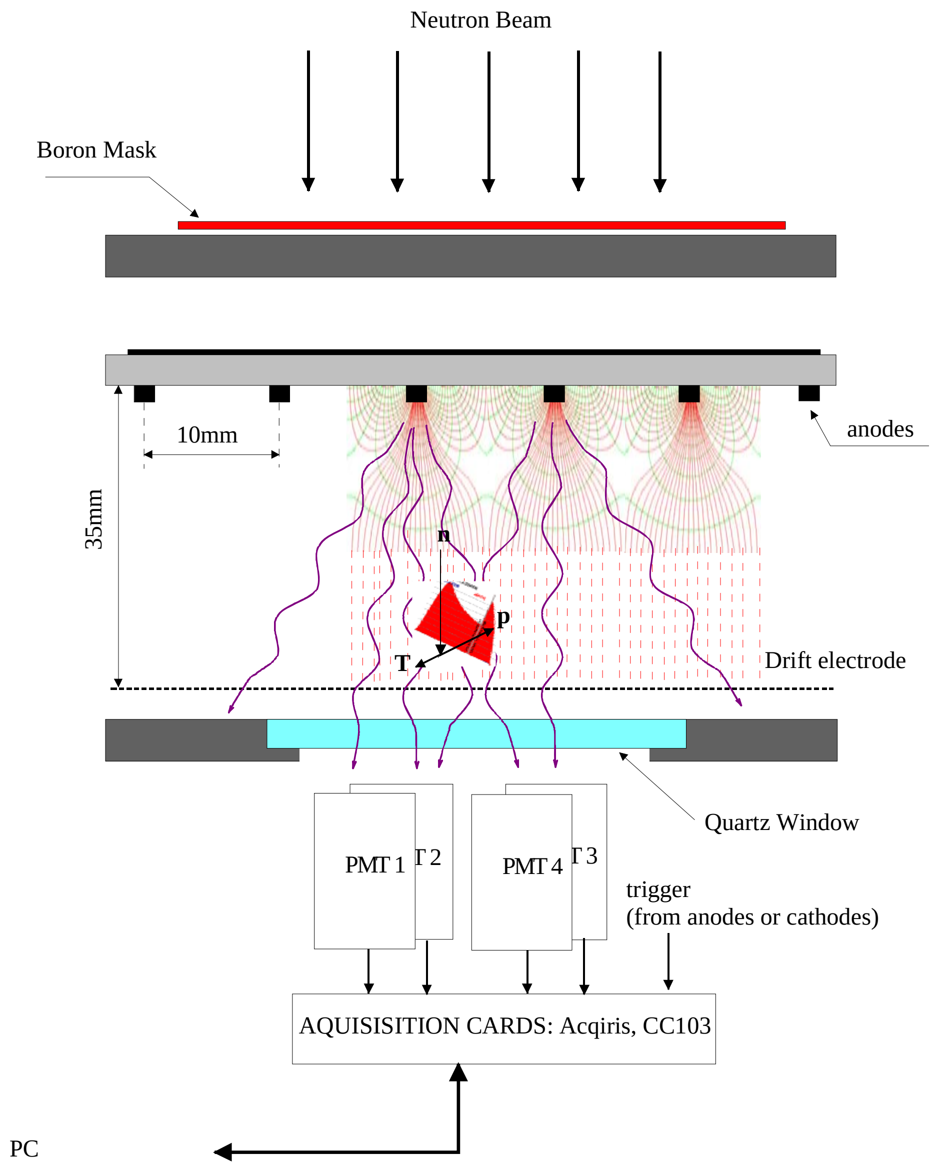


Experimental data taken with $ArCF_4$ and GEM using 2x2 38mm R1387 Hamamatsu PMTs

Scintillation Anger camera



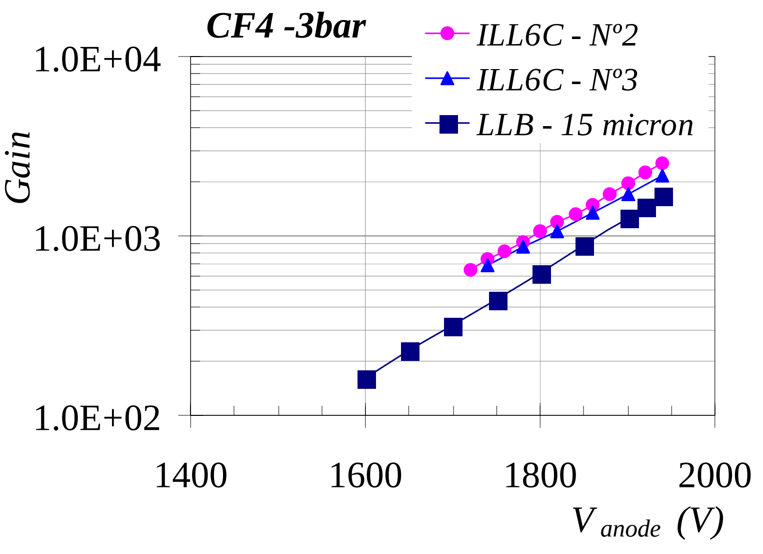



Neutron Beam
Boron Mask
10mm
35mm
anodes
n
p
T
Drift electrode
Quartz Window
PMT 1
T 2
PMT 4
T 3
trigger
(from anodes or cathodes)
AQUISISITION CARDS: Acqiris, CC103
PC

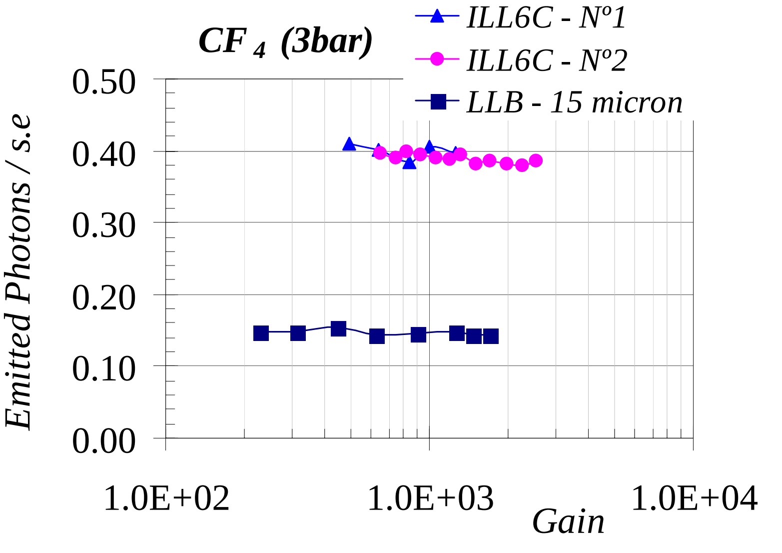
Not to scale!

MSGC ILL6C at High pressure

- Optimization of the MSGC for light output: light versus charge ratio for different anode widths
- Measurements at 3 bar CF_4

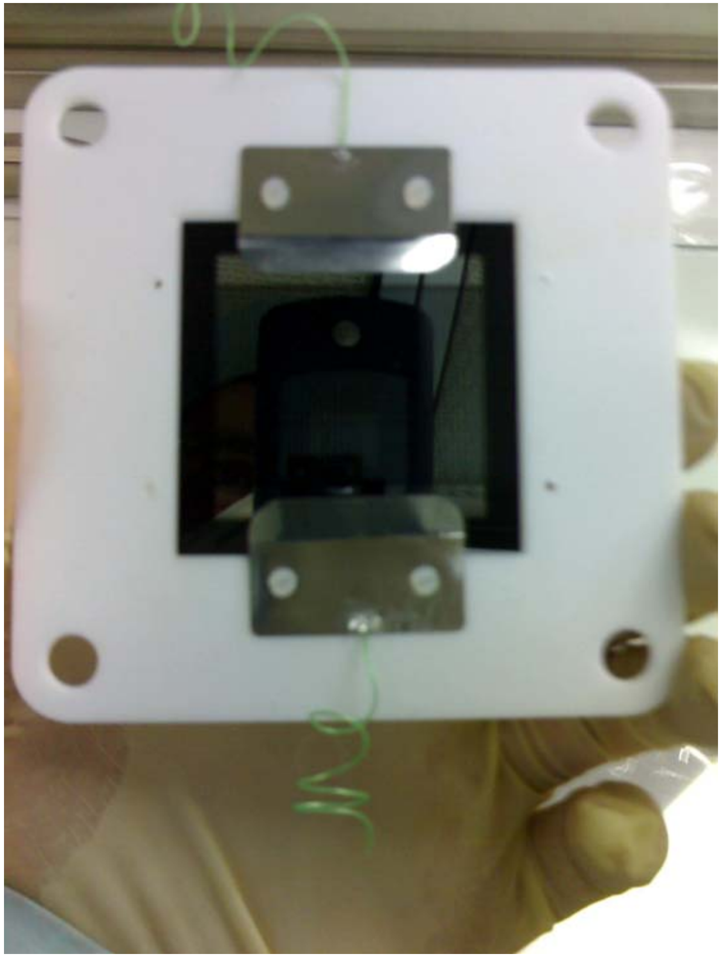


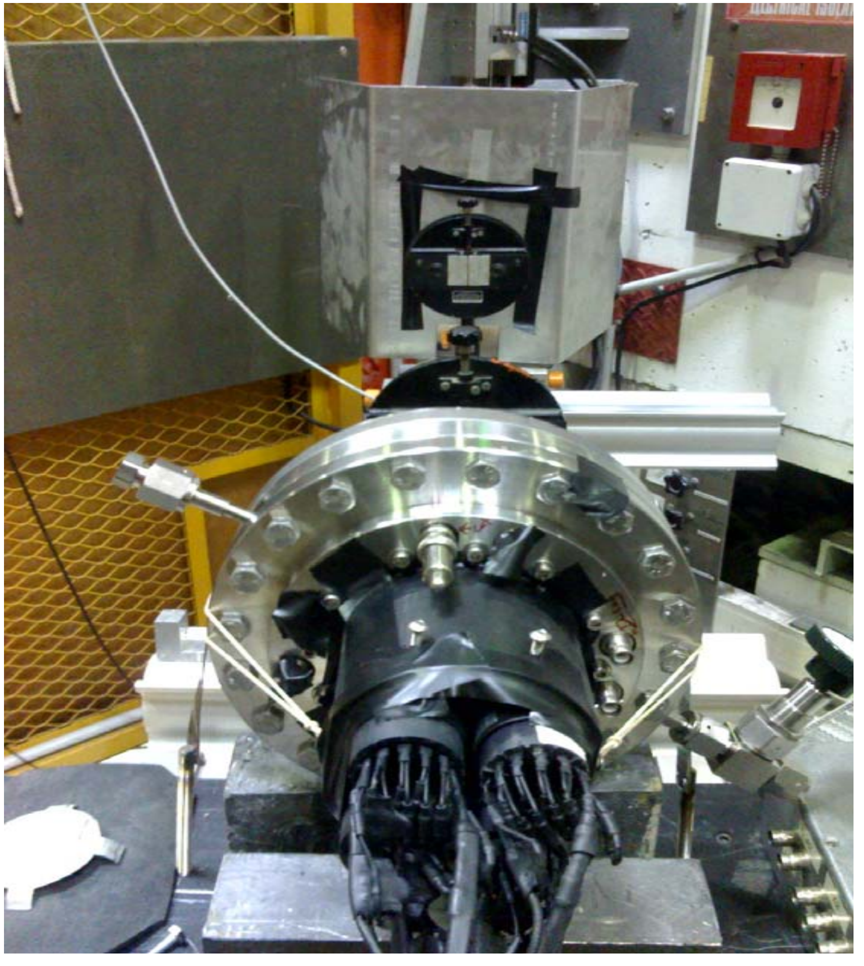
Charge gain *versus* anode voltage



Number of emitted photons per secondary electron

GSPC details

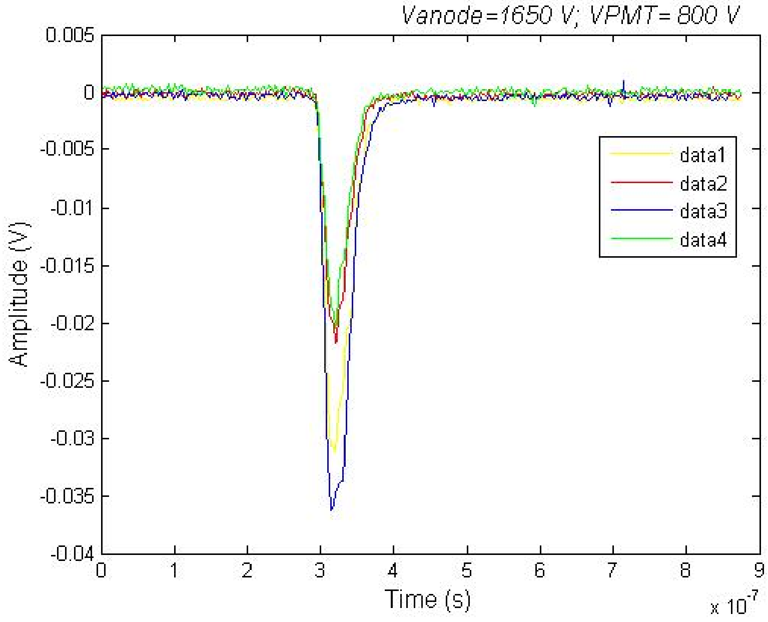


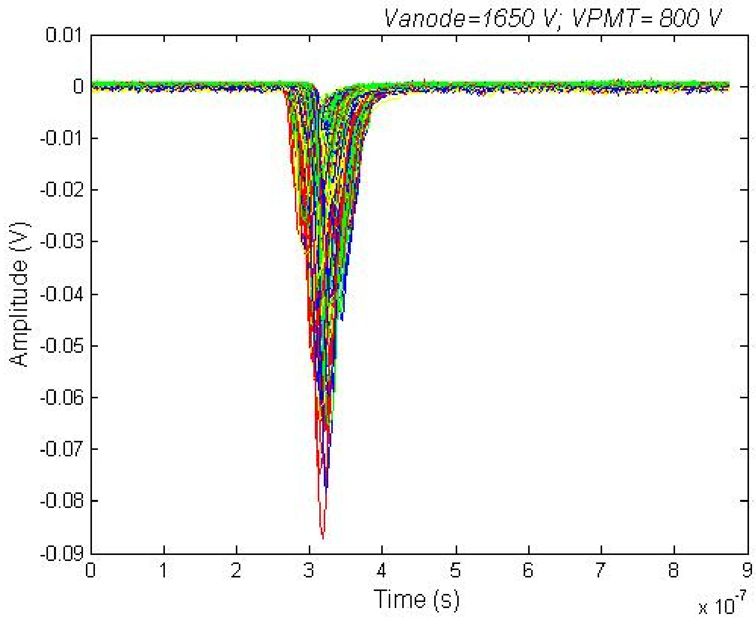


GSPC (3 bar CF_4) in position at the ILL beam

Aquisition system by Acquiris and E. Shooneveld

Typical PMT signals

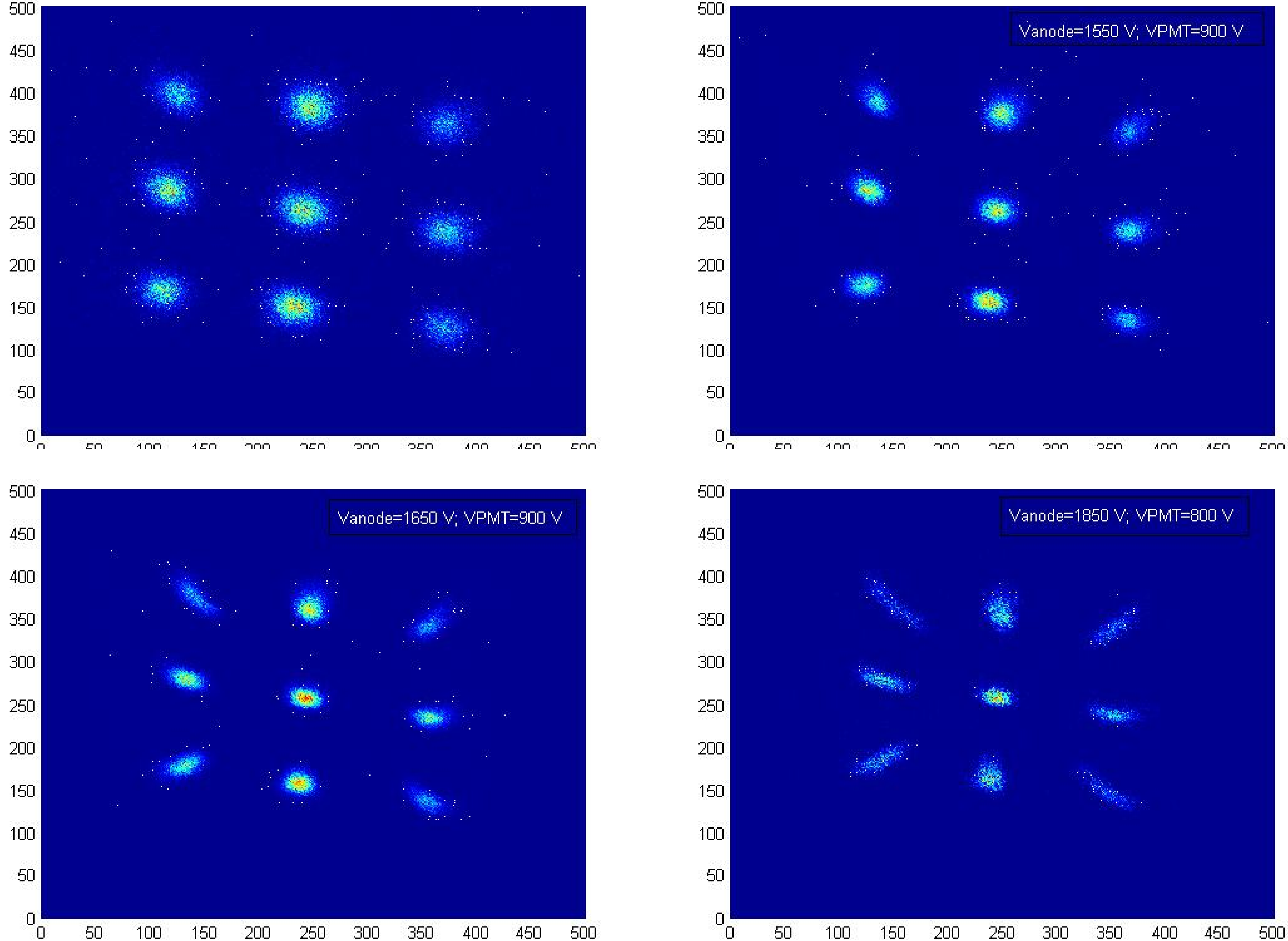




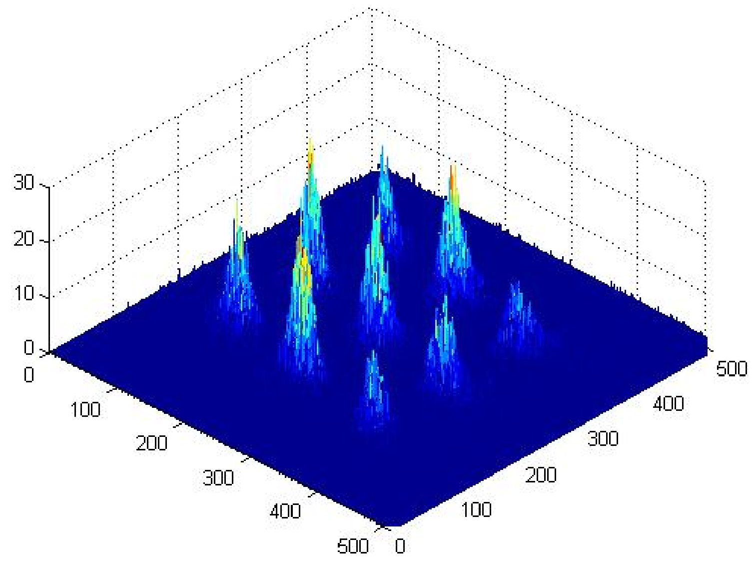
High amplitude – good discrimination

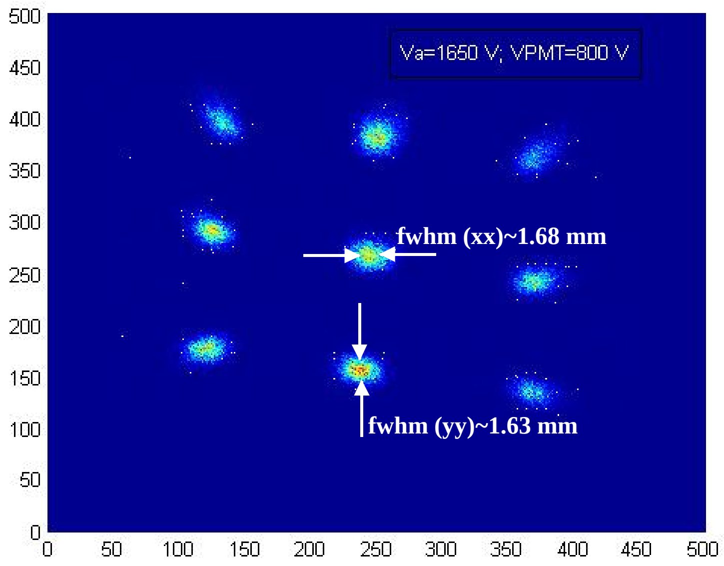
Very fast signals – risetime ~20ns

2D position images V_{anode} = 1360, 1550 1650 and 1850V

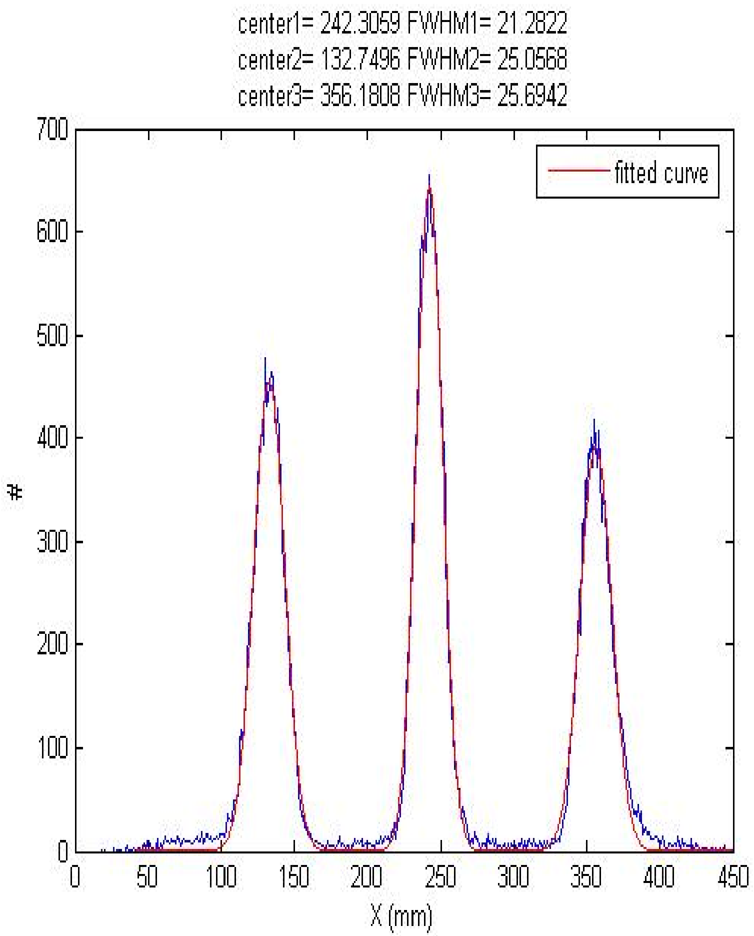


Mask_1650_3.eve: Va=1650 V; VPMT= 800 V.

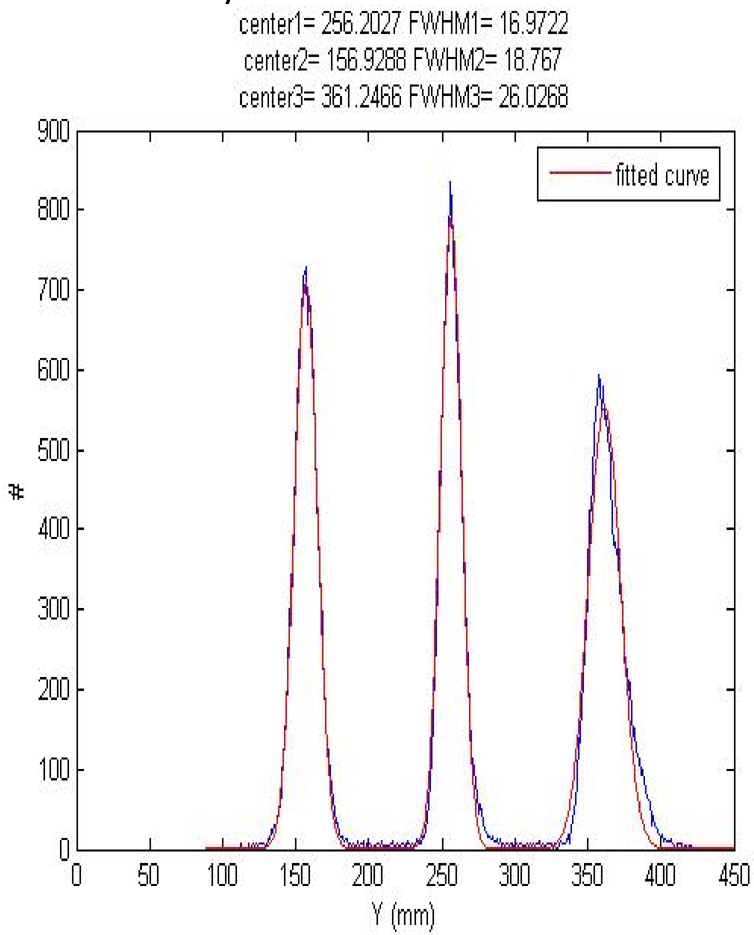




Mask_1650_3.eve: Va=1650 V; VPMT= 800 V

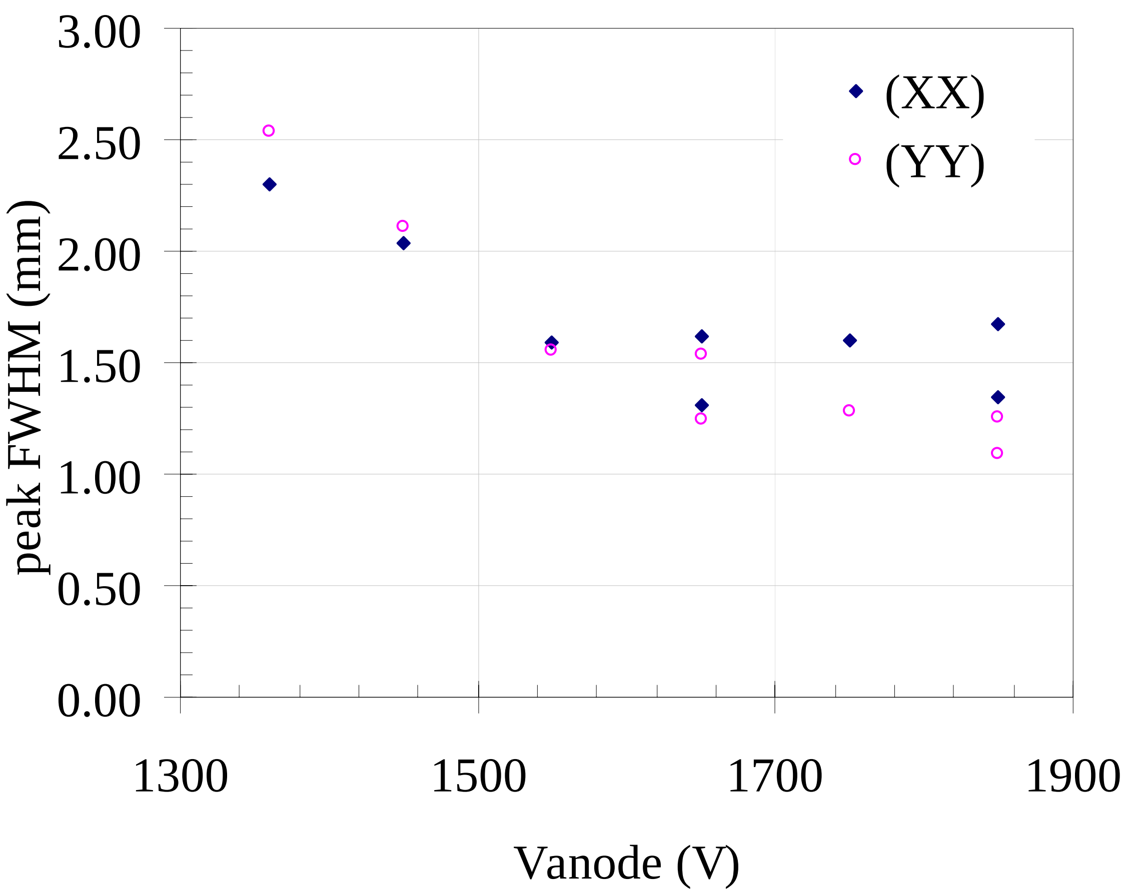


FHWM center
peak 1.68 mm



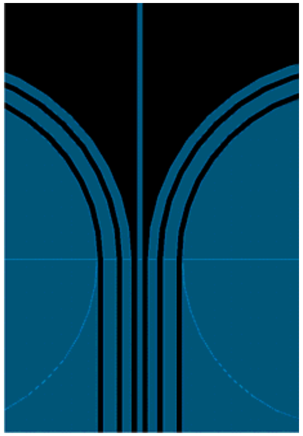
FHWM center
peak 1.63 mm

FWHM resolution versus V_{anode}



•For the best safe conditions (V_{anode} =1850 V; V_{PMT}= 800 V) the intrinsic resolution is 1.1mm after we deconvolute the beam width

Transparent electrode MSGC

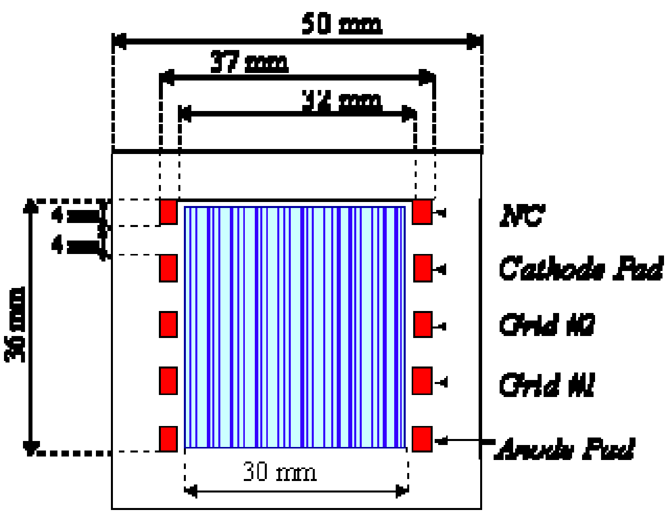


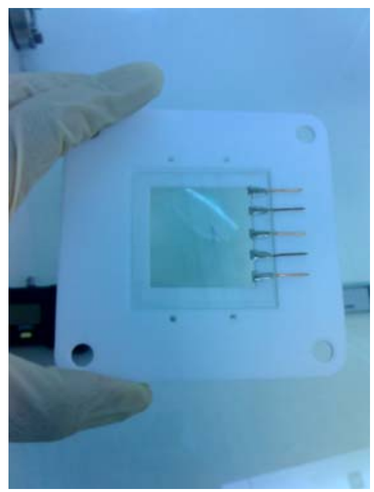
- Manufactured at the Tokyo University and supplied by Hiroyuki Takahashi
- 90% electrode transparency
- The transparent window can be the active element
- Multigrid approach proposed –it has the advantage of a very high local count rate.

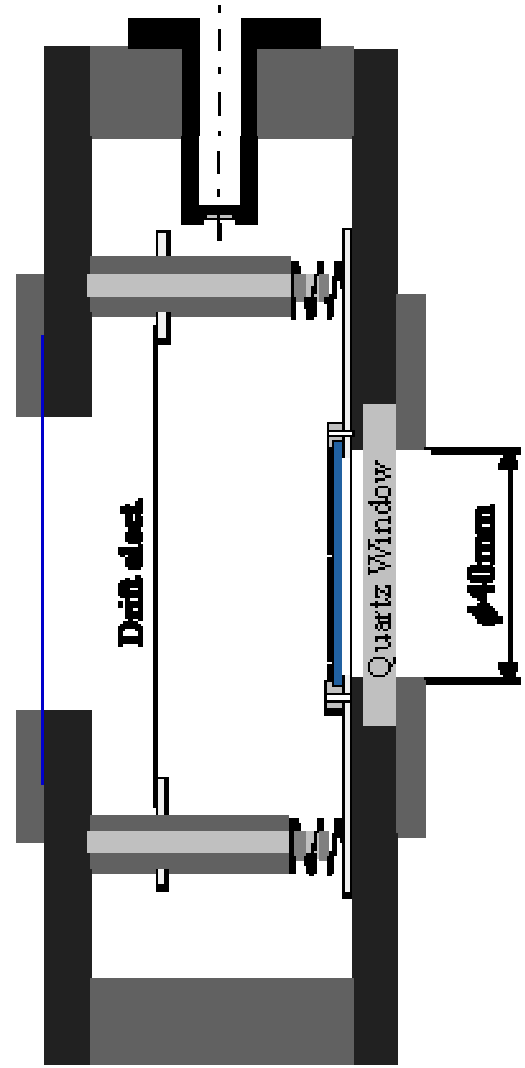
ITO M - MSGC

❑ Experimental Setup

- Drift length = 10 mm
- Distance between microstrip and PMT = 34.8mm

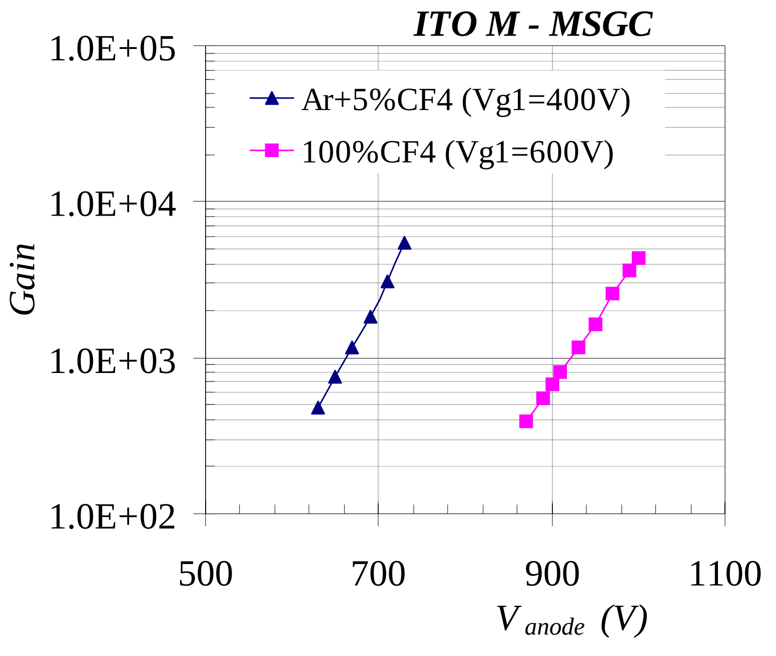


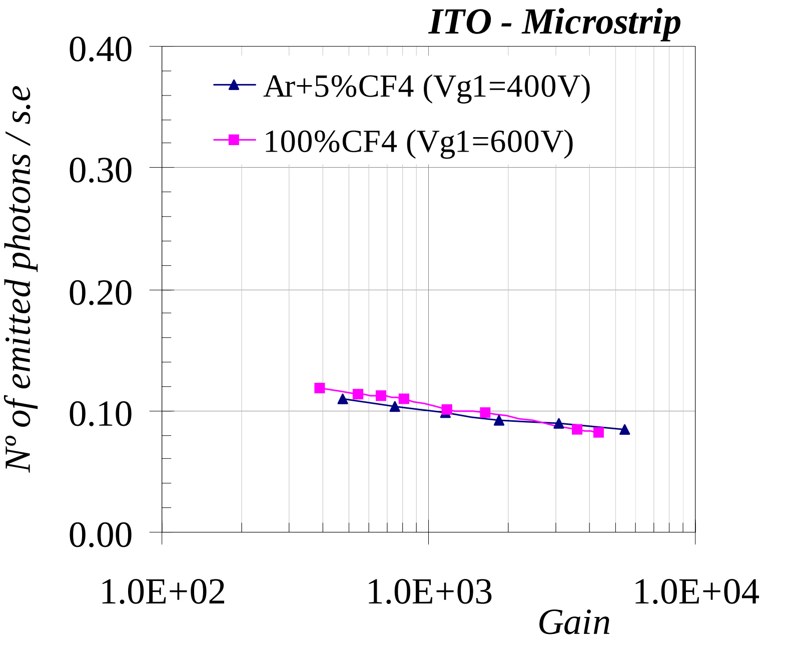




ITO M - MSGC

- Ar+5%CF4 (1atm, 100cc/min.) and CF4 (1atm, 100cc/min.)



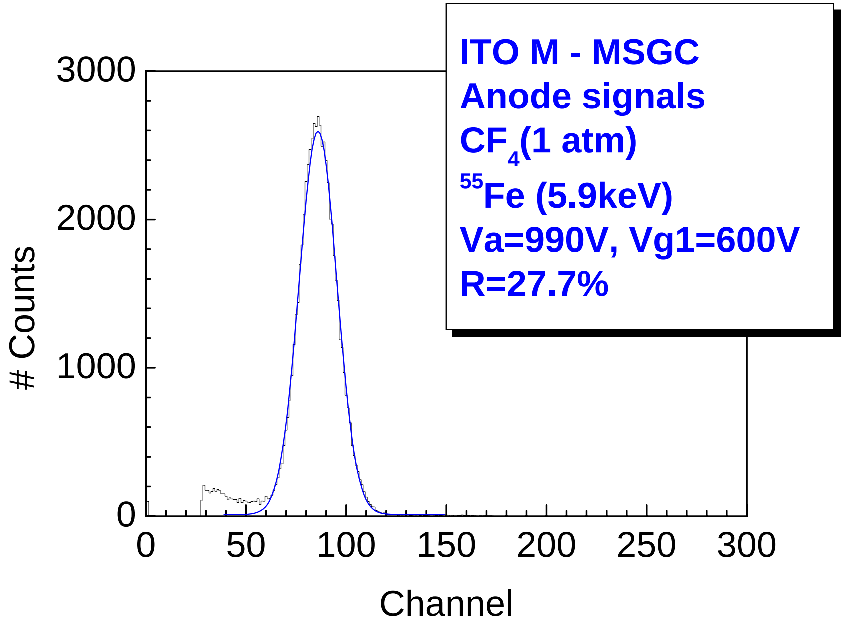


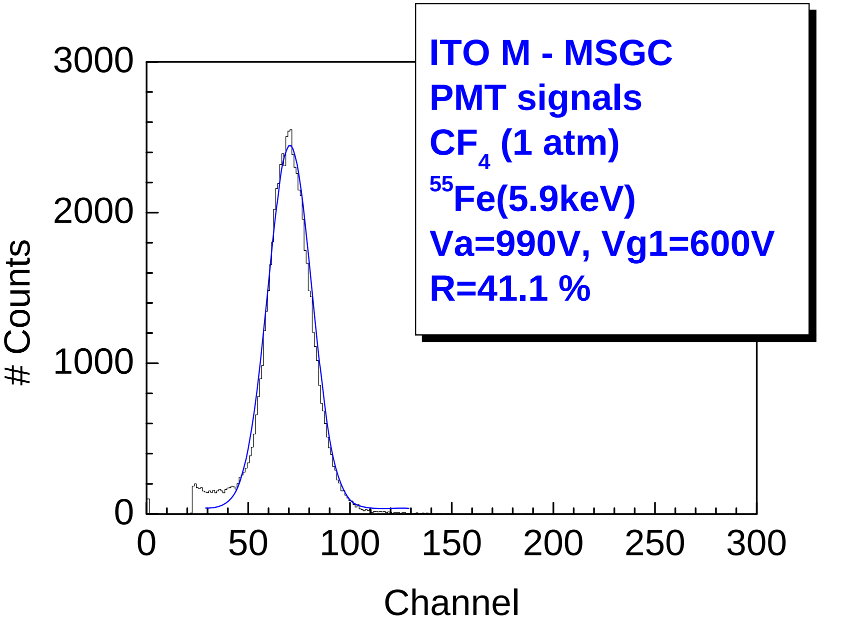
Charge gain *versus* anode voltage

Number of emitted photons per secondary electron

ITO M - MSGC

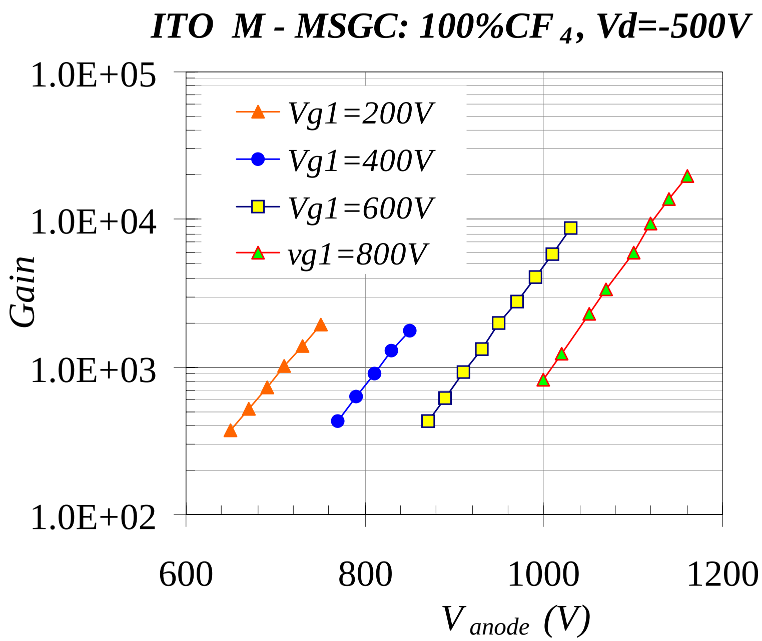
- Anode and PMT signals pulse height spectra: **100%CF4 (1atm)**



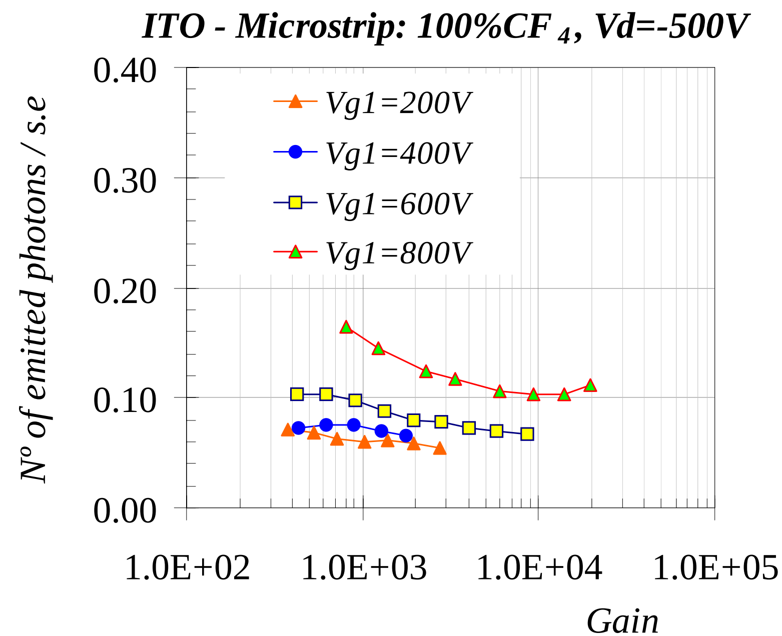


ITO M - MSGC

- Effect of GRID potential (Vg) on Gain and light yield



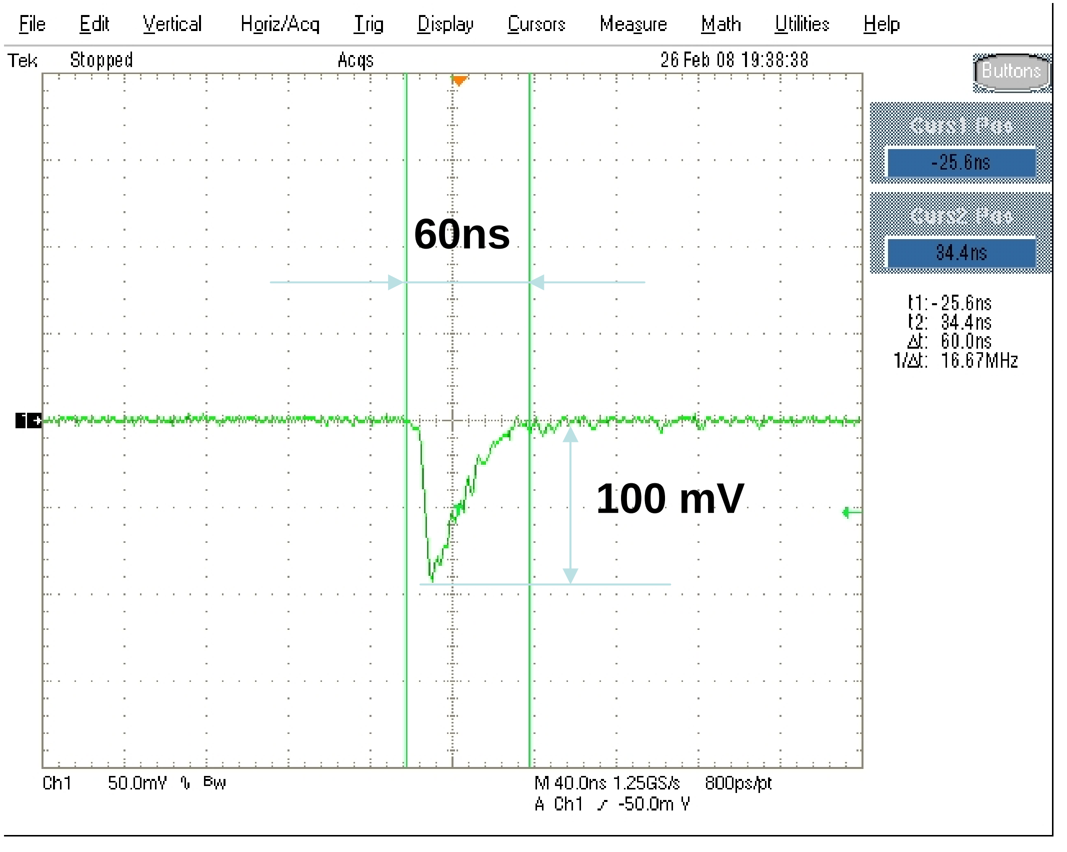
Charge gain *versus* anode voltage for several GRID voltages



Number of emitted photons per secondary electron

ITO M - MSGC

- **Example of typical signal taken directly from the PMT Hamamatsu R1387** (R_L=50 Ω): [55]Fe (5.9keV) X-ray source



- 100%CF_4 (1bar)
- V_{drift}= -500V, $V_{cathode}$=0
- V_{anode}=990V Vg1= 600V
- V_{PMT}=-1000V

Conclusions

- Gaseous Anger camera can reach 1 mm resolution with He CF_4
- Signals are very fast – high peak count rate
- The gas gain limitation is still a problem
- The ITO MSGC works and can solve the conversion gap optimzation problem