



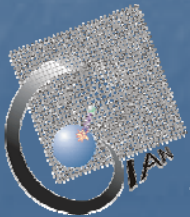
MHSP with position detection capability

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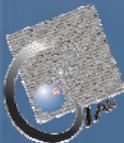
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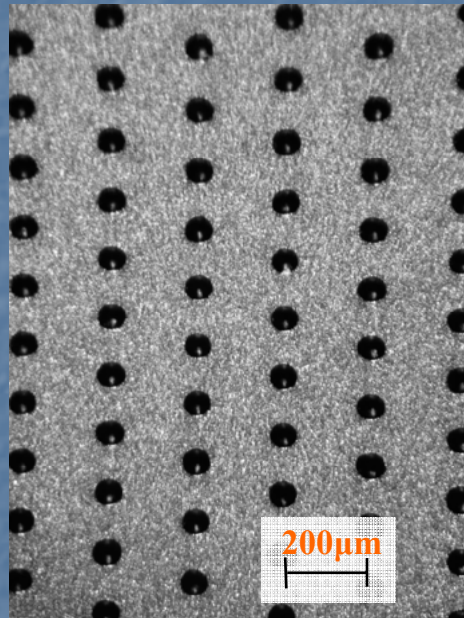
Outline

- The Micro Hole and Strip Plate – working principle;
- Applications;
- 2D capability – 1D prototype;
- Position linearity and resolution – results;
- Conclusions and future work.

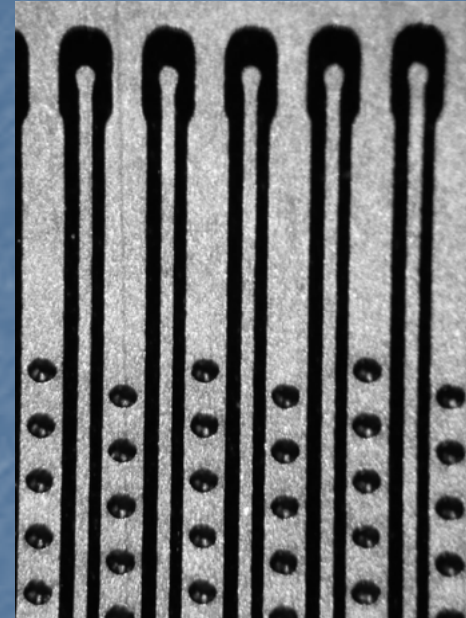


The Micro Hole and Strip Plate - MHSP

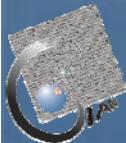
Top



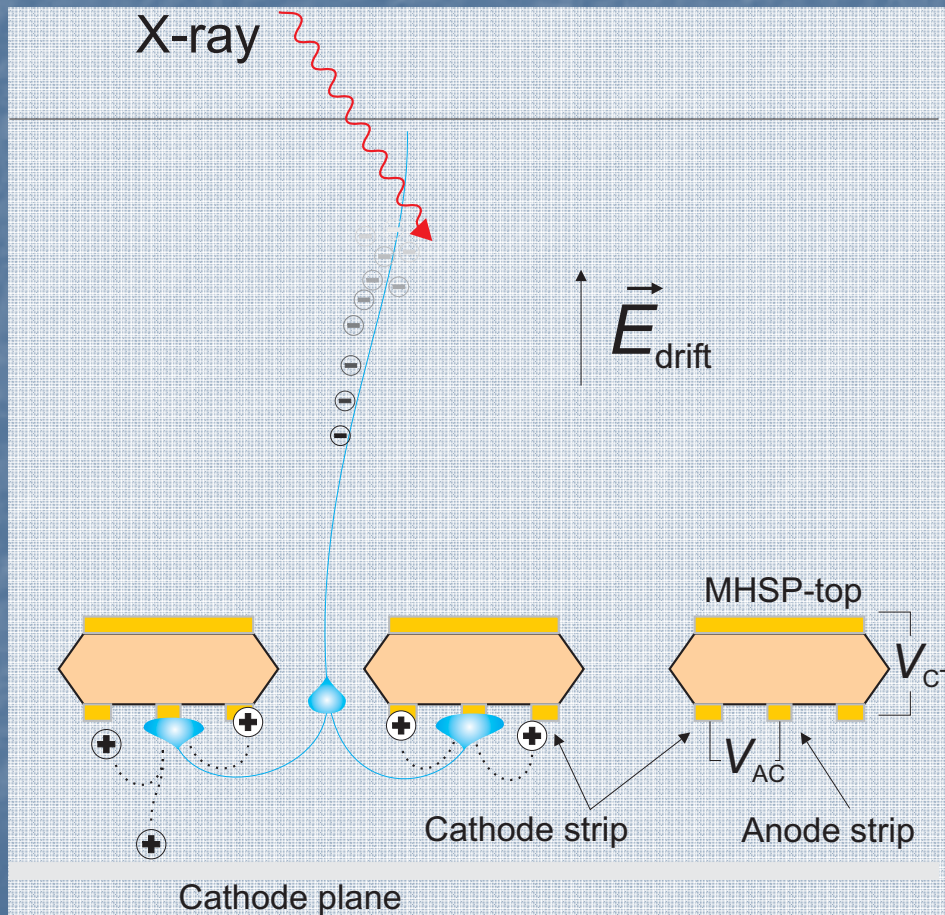
Bottom



- A MSGC and GEM combination in a single plate
 - hole / strip pitch $\sim 200 \mu\text{m}$
 - Distance between holes $\sim 140 \mu\text{m}$

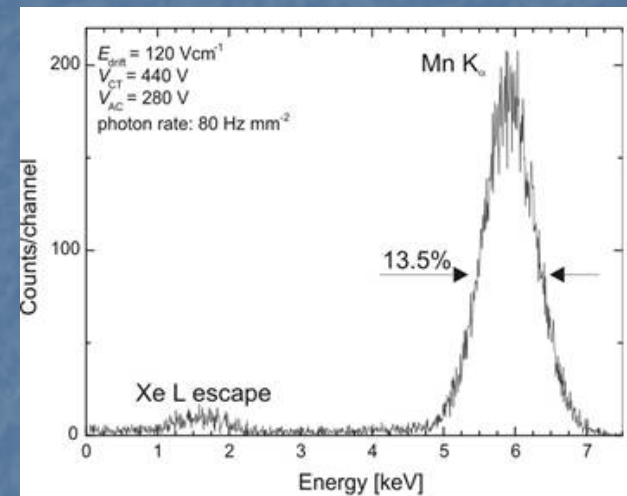


The Micro-Hole & Strip Plate gas detector operation



2 multiplication stages

- Hole gain $> 10^3$
- MS gain $\approx 30-100$
- Gain $> 10^5$ for several gases

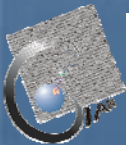


e.g.,
[Veloso *et al.*, RSI, 71\(2000\)2371](#)
[Maia *et al.*, NIM A 504 \(2003\)364](#)
[Veloso *et al.*, NIM A524 \(2004\)124](#)

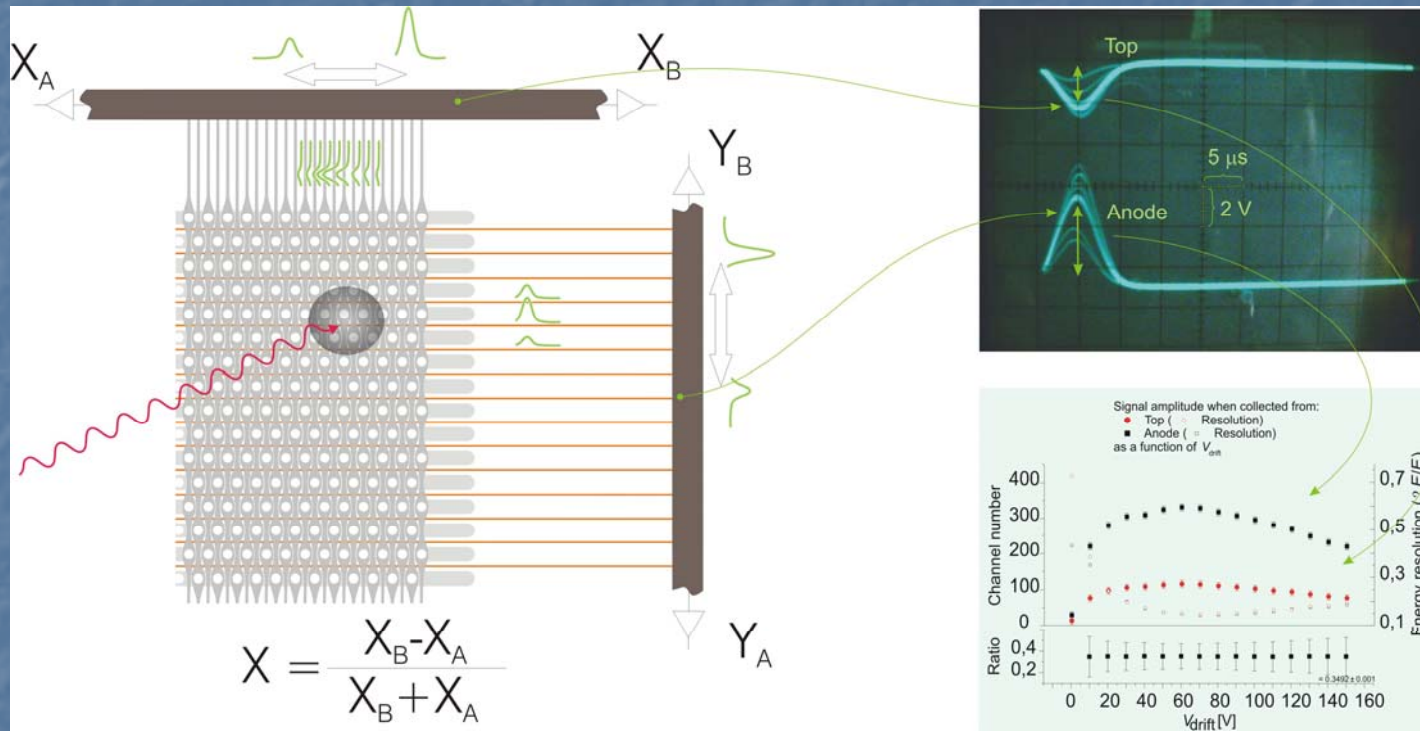


Applications

- Atmospheric pressure:
 - High gain multipliers in standard and noble-gas mixtures (simple to purify - no gas ageing)
 - X-ray & UV-Photon detectors
- High pressures:
 - Noble gas mixtures
 - Dual-phase (liq/gas) detectors: Dark-matter, PET, etc.
 - Hard X-ray & n detectors, etc.



2D MHSP configuration

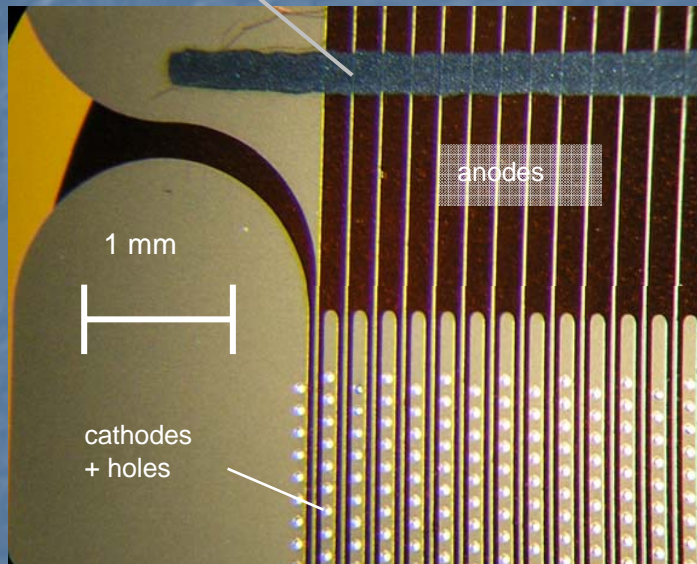


- Possibility of collecting the signal from the top anode.
- By structuring both sides, 2D readout by resistive charge division is possible.



MHSP with resistive charge division 1D readout

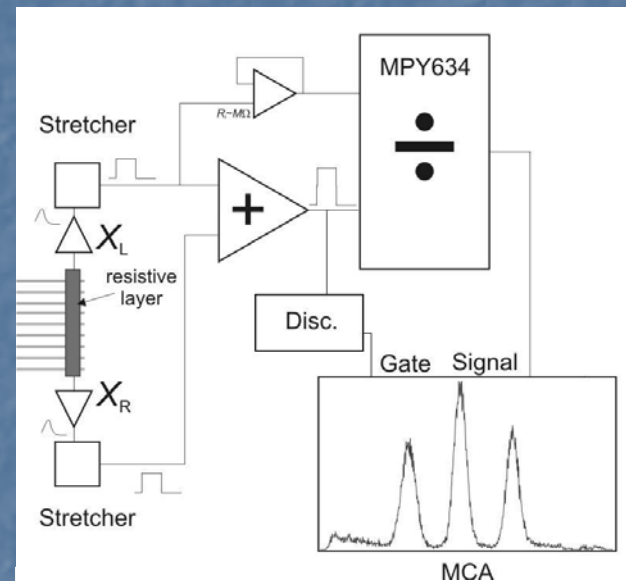
Resistive layer



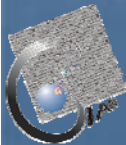
^{109}Cd source used for the measurements

$K_{\alpha} = 22.1 \text{ keV}$

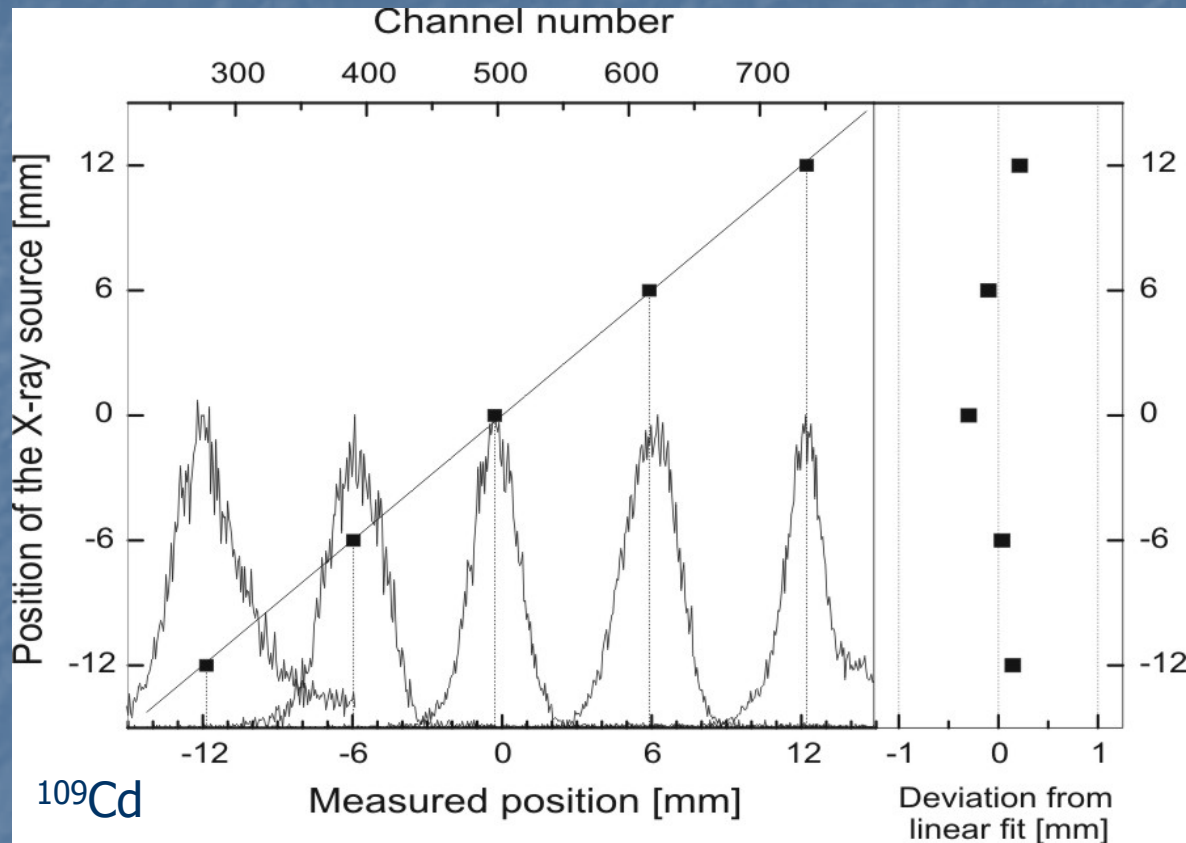
$K_{\beta} = 25.6 \text{ keV}$



$$X = k \frac{X_L}{X_L + X_R}$$



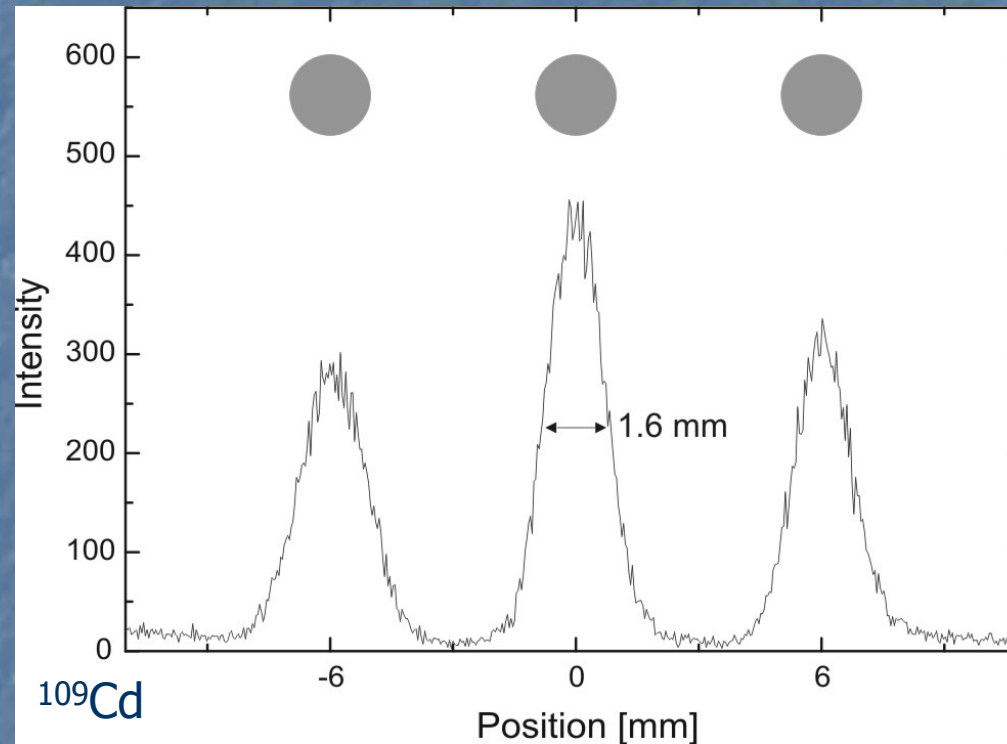
Position linearity



Mean deviation from linearity ~ 0.15 mm



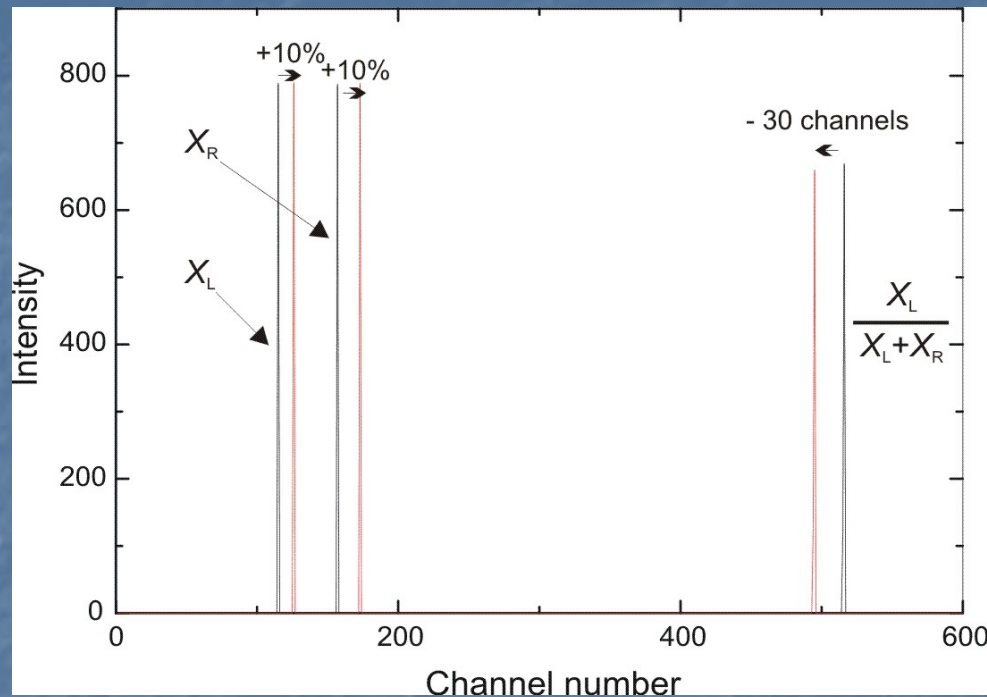
Spatial resolution



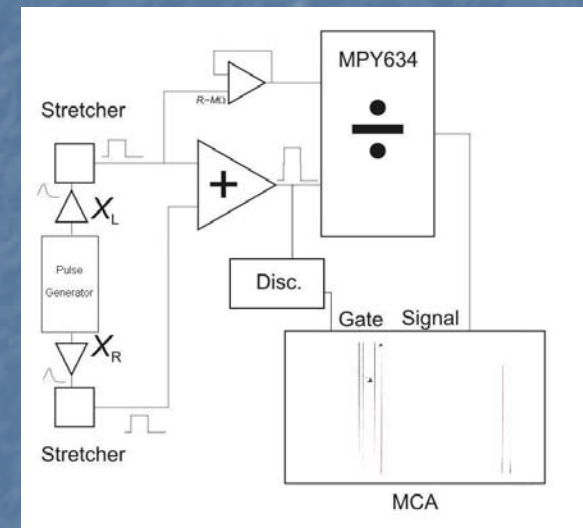
- Collimator holes: 2 mm in diameter
- No improvement in resolution for smaller holes!



Measurements with pulse generator



- Good FWHM.
- Bad division!!!
- Spatial resolution is being limited by 1.3 mm due to the electronic division circuit.

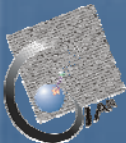


Conclusions

- Inexpensive and simple construction;
- Good position linearity;
- Spatial resolution is limited by the electronics, detector position capability not yet fully exploited.

The future

- Better analogue division electronics is needed;
- Structuring of the top side for 2D position determination.



Thank you
for your attention!

