

New Thick Hole-Type Structures for Gaseous Detectors

João Veloso

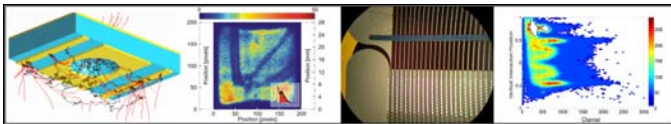


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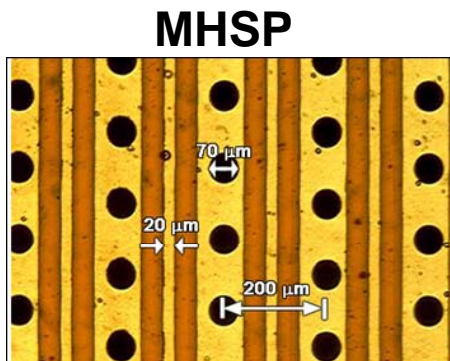
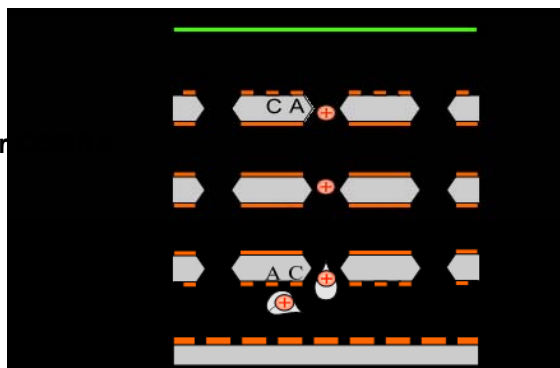


A. Breskin and R. Chechik
Weizmann Institute of Science, Rehovot

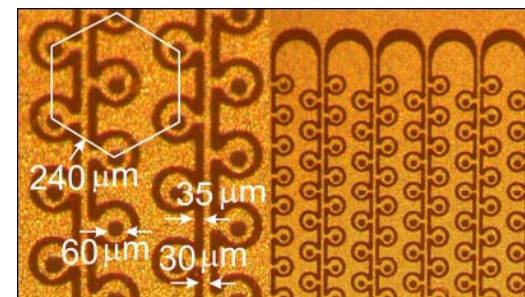


IBF Achievements with MHSP and COBRA

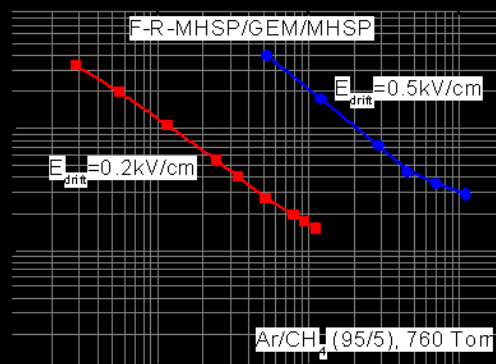
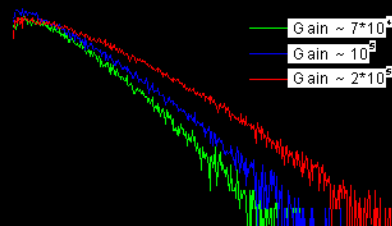
- Achievements with the F-R-MHSP shows IBF level needed for visible sensitive GPM.
- Also with COBRA, but this one with limited collection efficiency.



COBRA

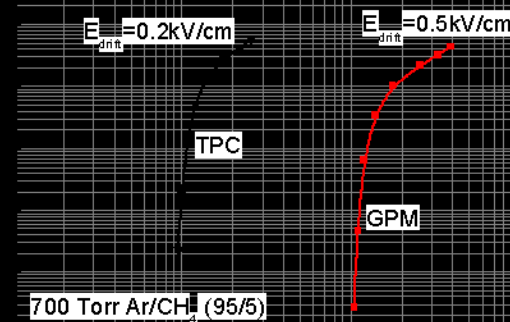


F-R-MHSP/GEM/MHSP
K-Cs-Sb (QE ~11% @ 375nm)



IBF close to 10^{-4}
Full ECE

Flipped-Cobra/2GEM

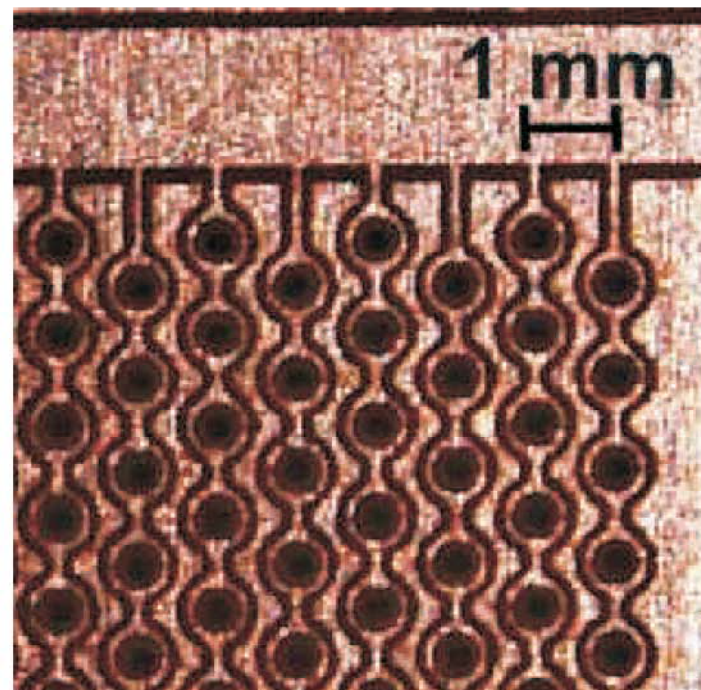
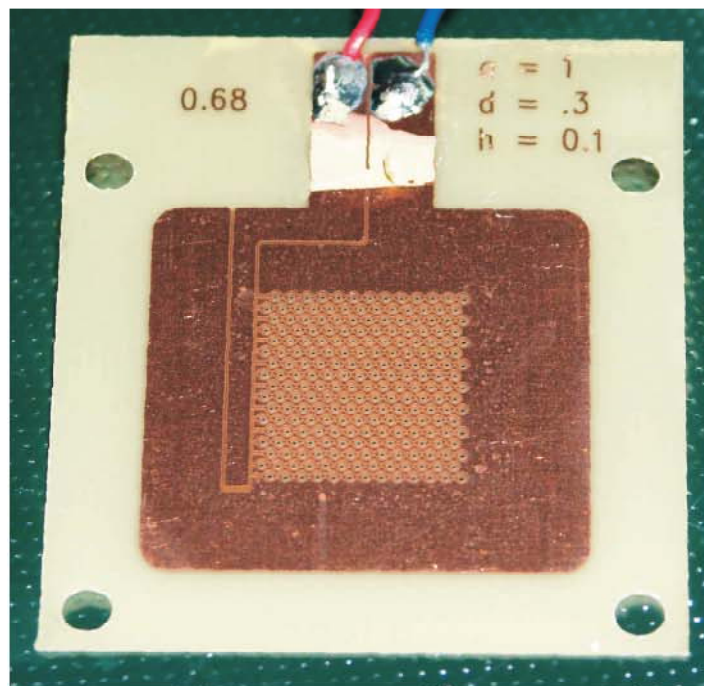


IBF 1000 x lower than with GEMs
At the expense of ECE (20%)

A. Lyashenko et al., NIMA 598(2008)116
A. Lyashenko et al., NIMA JINST(2009), in press

Thick-? Structure – large areas

- In order to apply the same principle, it was produced a new Thick-structure with the goal of reduce IBF in cascade Thick-structures.
- Same principle of Thick-GEM production....

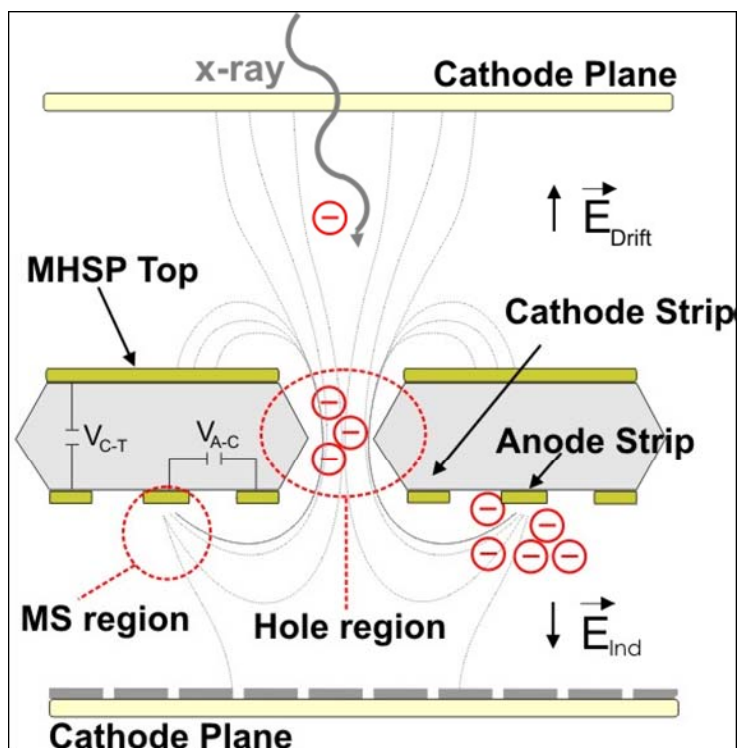


- Cathodes “strips” with a circular shape surrounding the holes;
- holes (0.3 mm diameter with a 0.1 mm rim), are placed in an hexagonal lattice with a pitch of 1.0 mm;
- anodes (0.3 mm wide), running between each pair of cathodes.

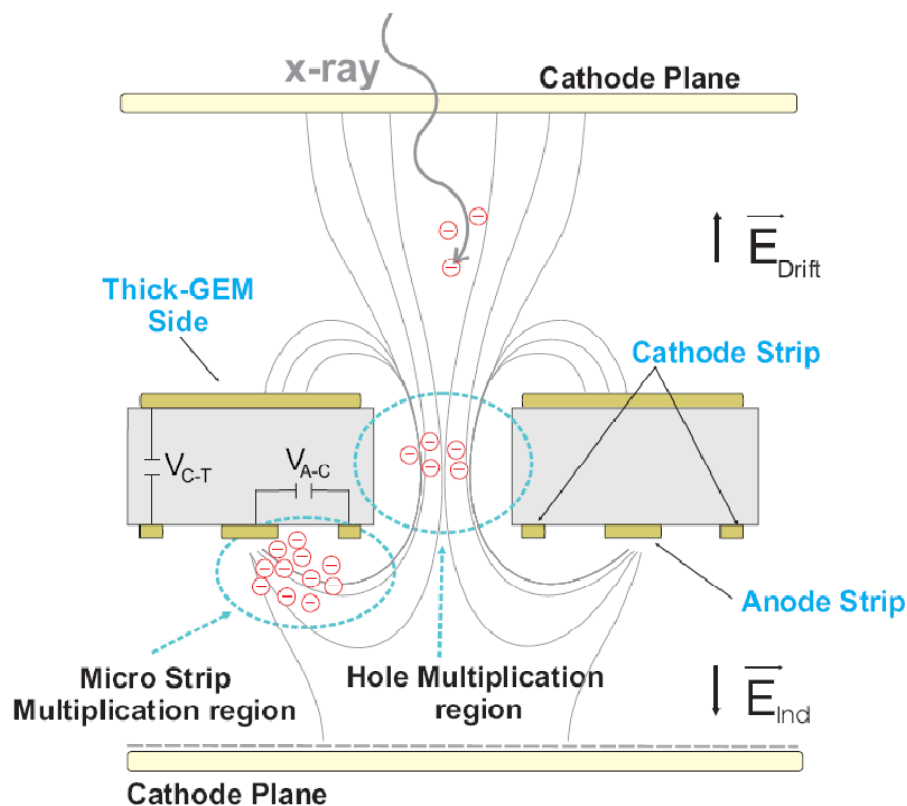
Thick-MHSP

- Before starting IBF studies we have polarized the structure like in a MHSP standard operation.
- Polarization scheme similar to MHSP

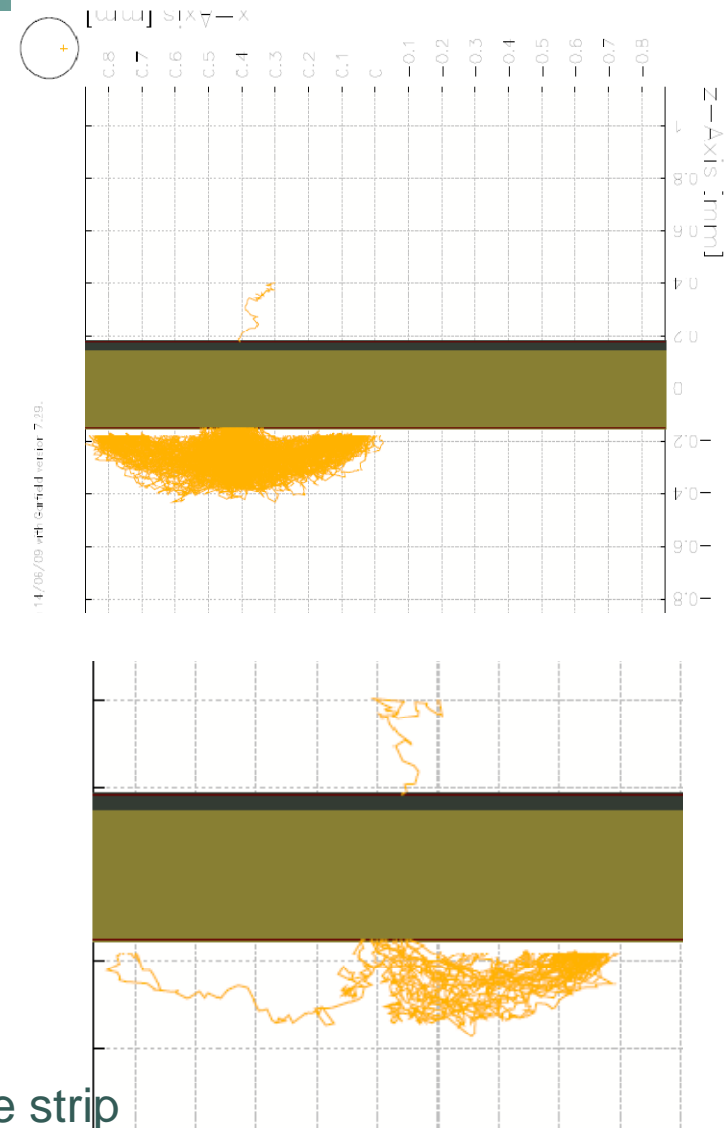
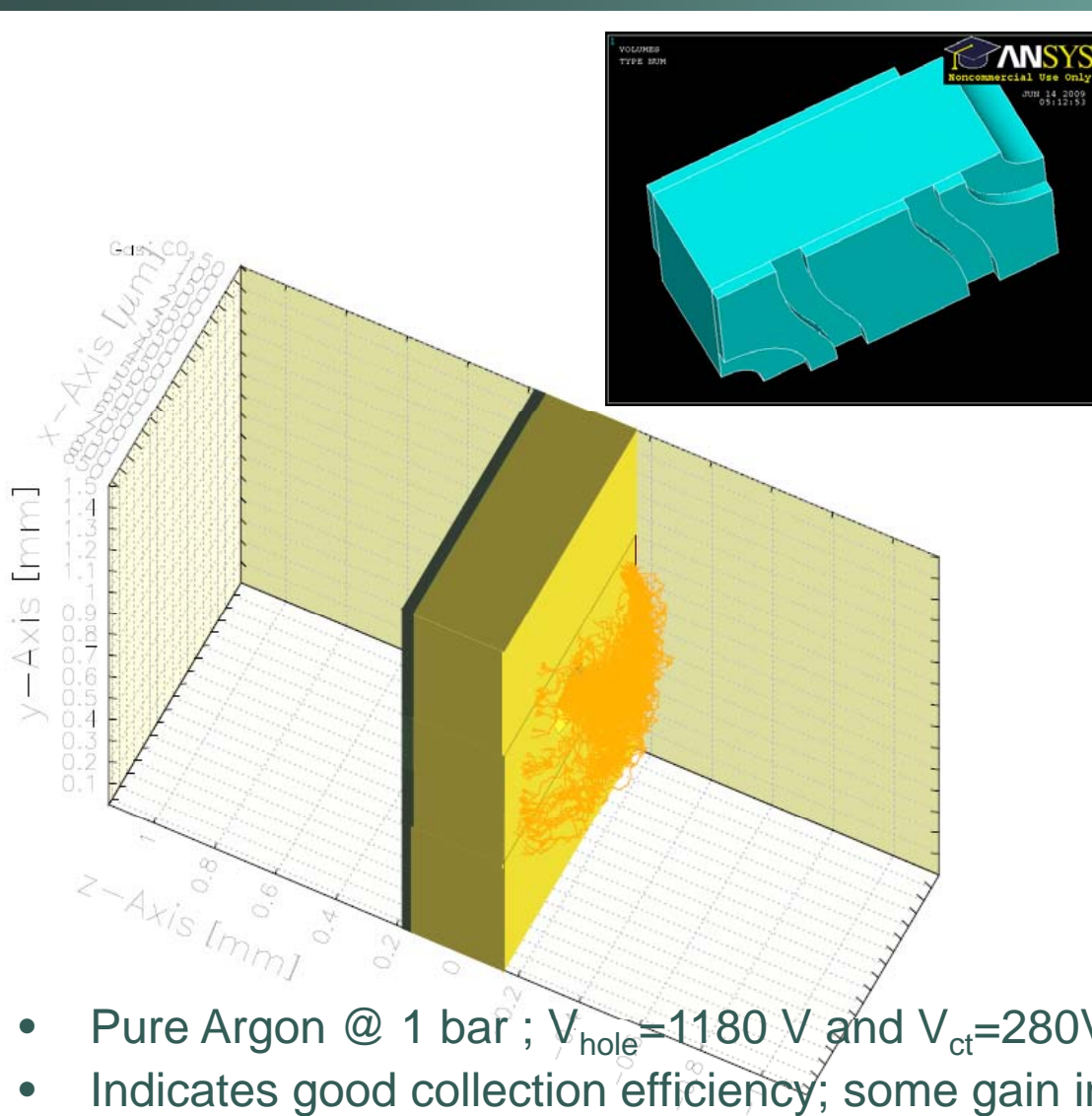
MHSP



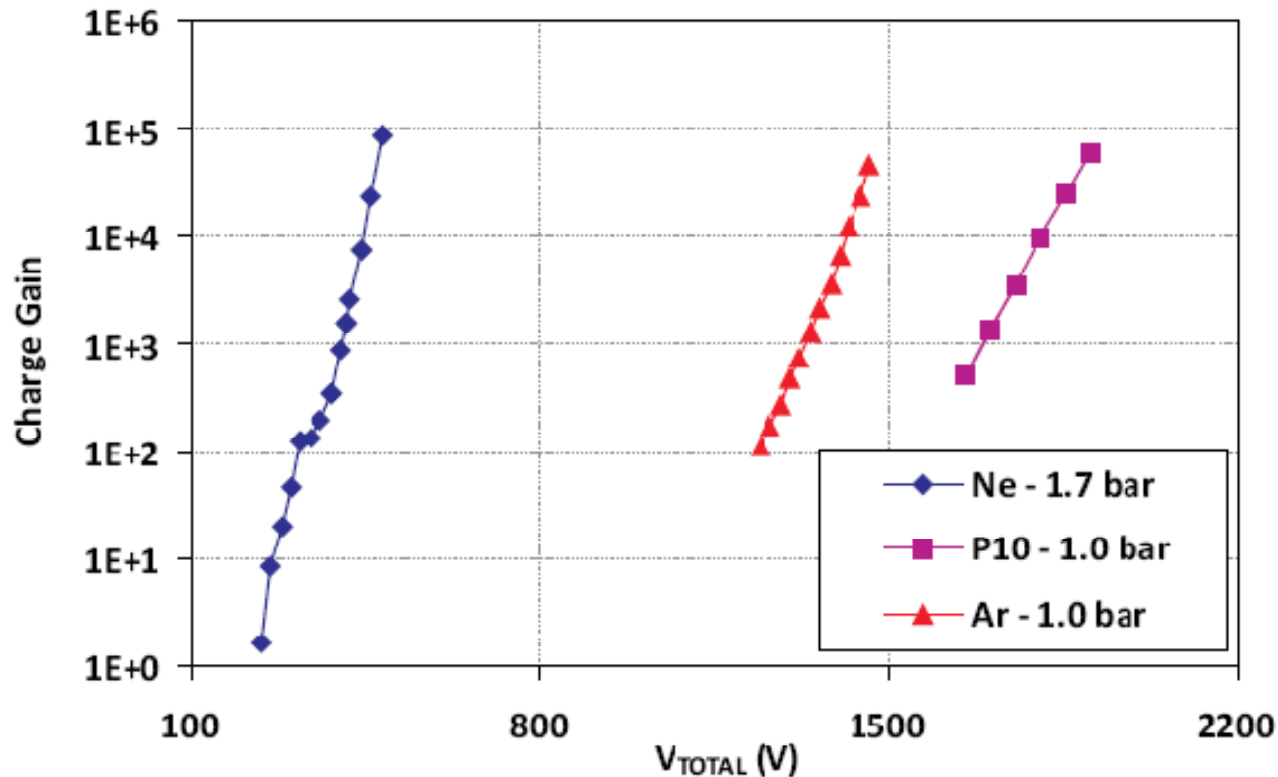
Thick-MHSP



First simulation results with Garfield (preliminary)

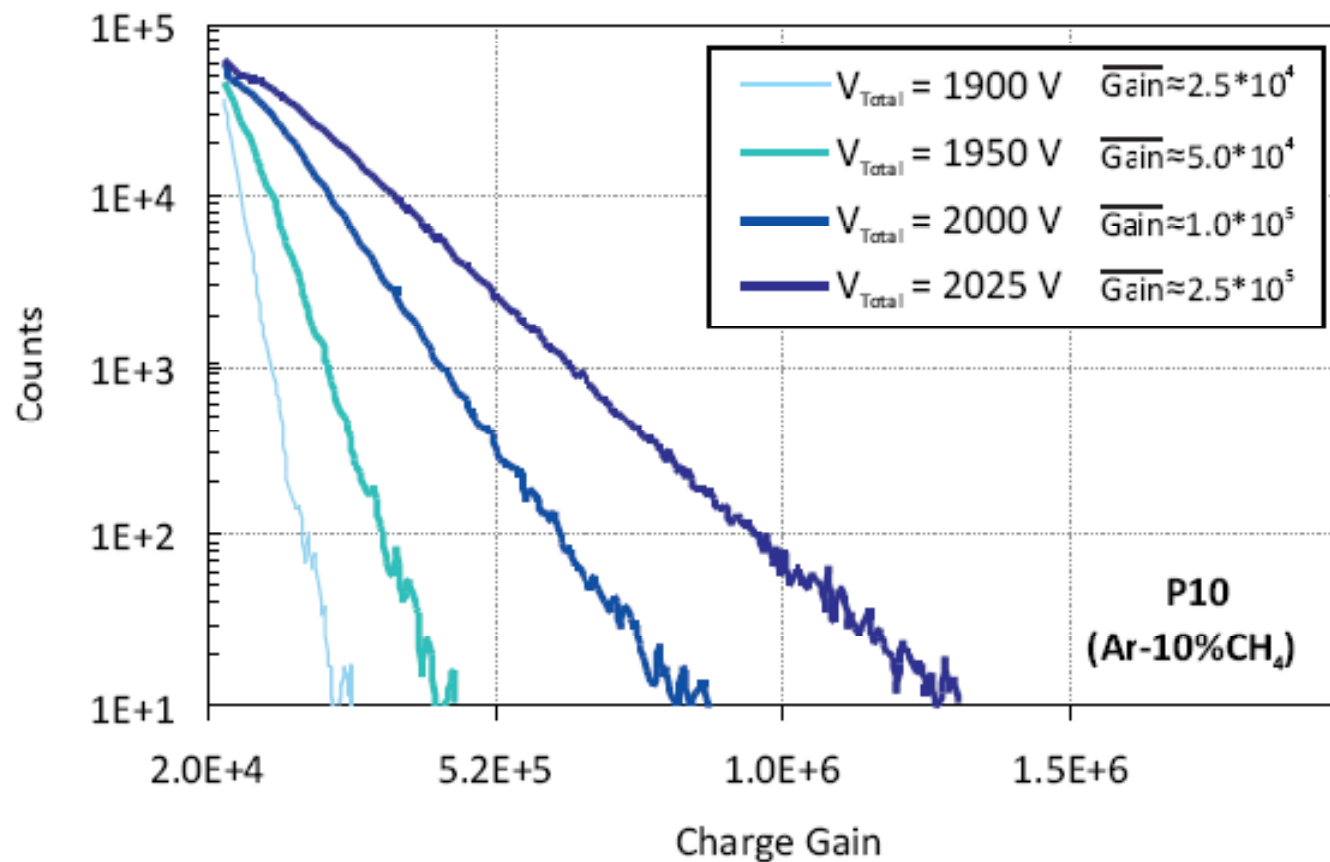


Thick-MHSP gain



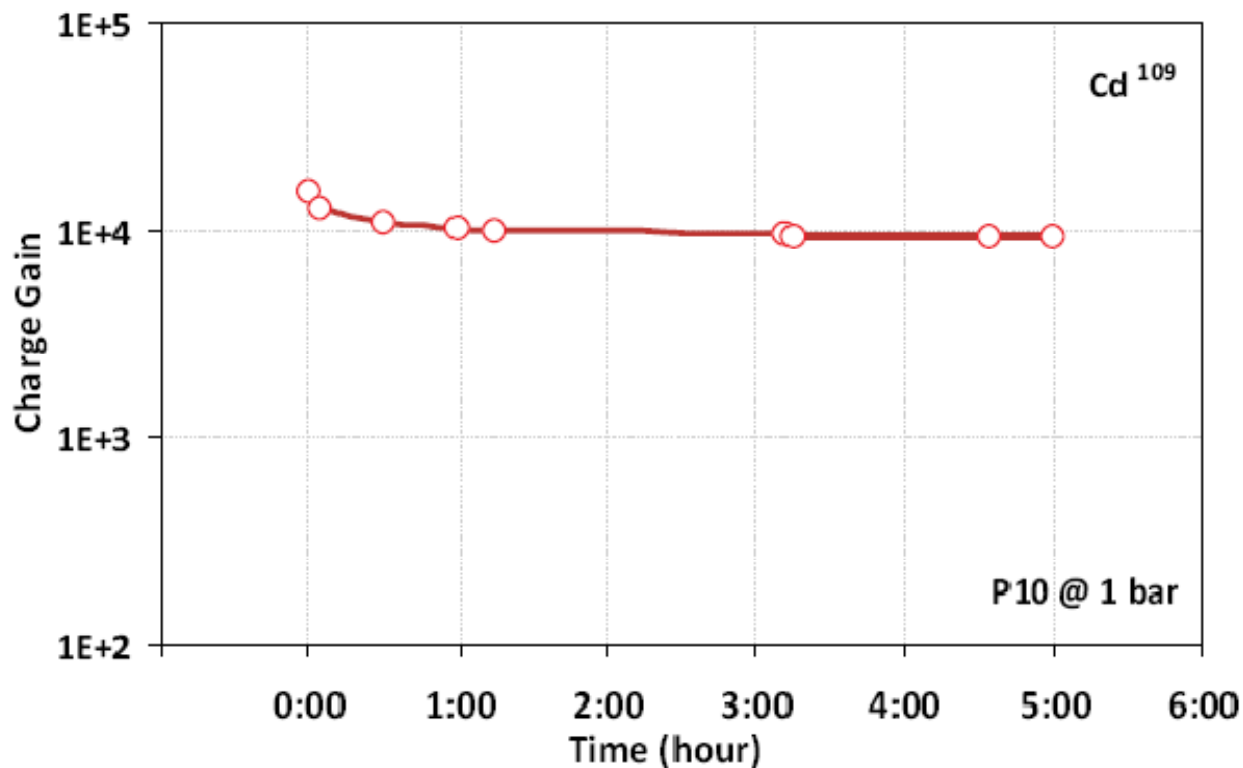
- From this study we got very surprising results:
- Gas gains of the order of 10^5 for all the studied gases

Single photon counting



- Good single photon response.

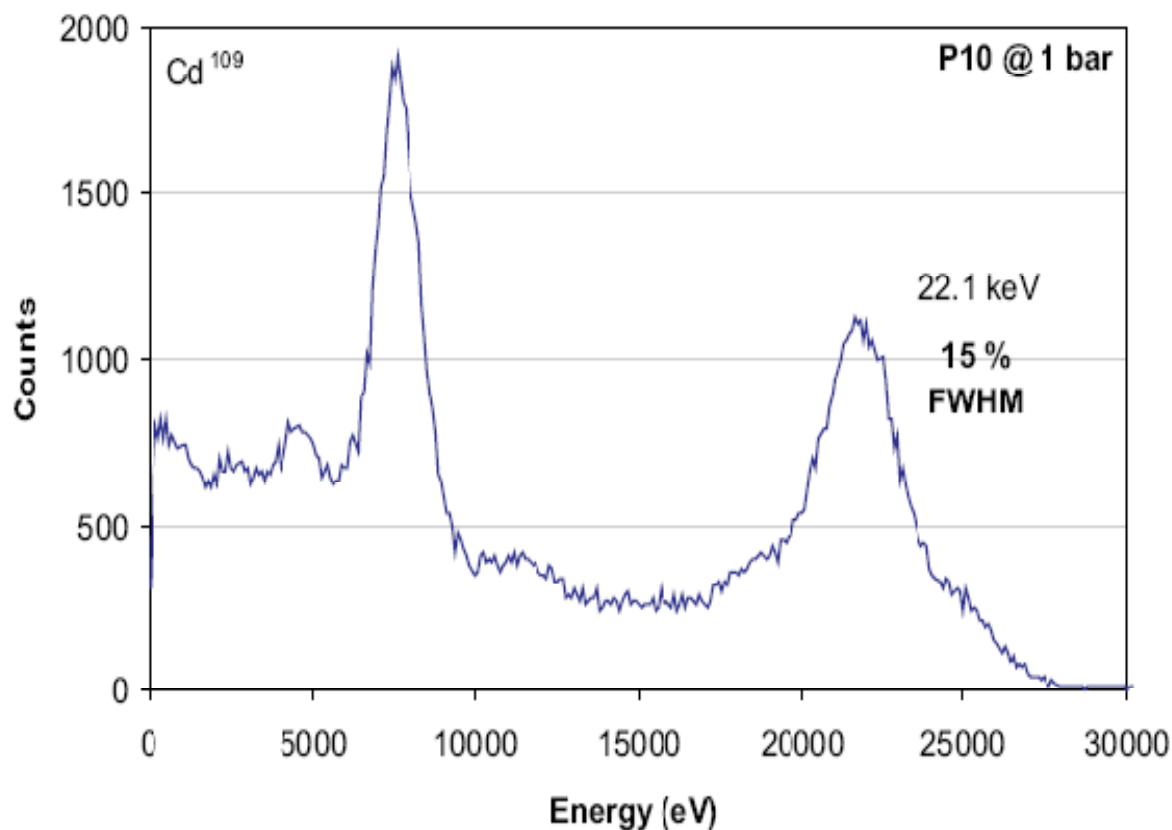
Time stability



- Good stability with time for the measured gain (10^4)
- Cd-109 x-ray source, low count rate $\sim 100\text{Hz}$

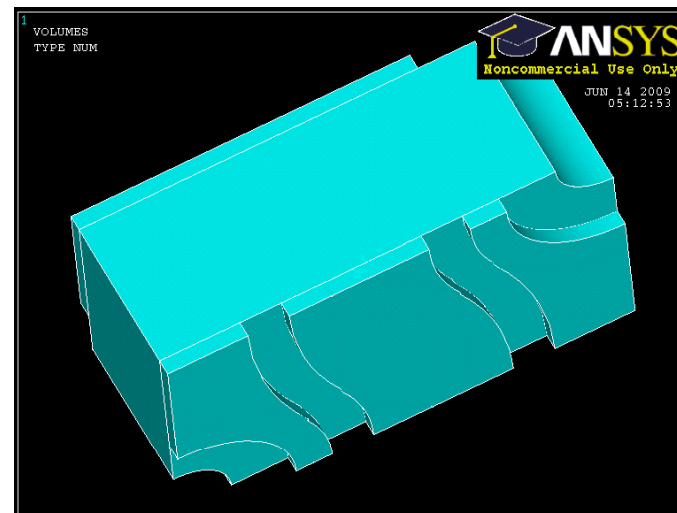
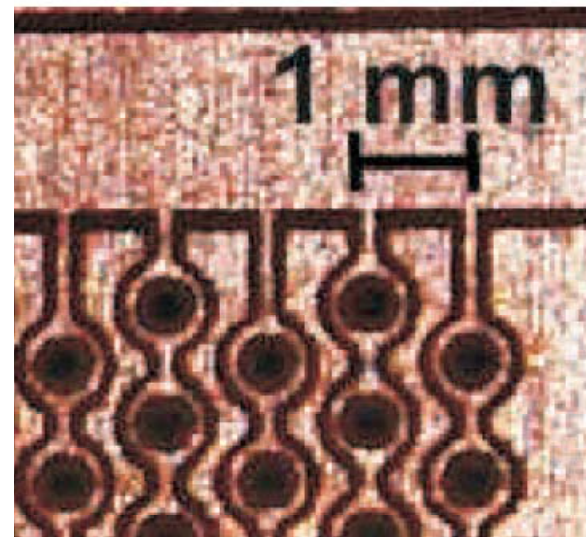
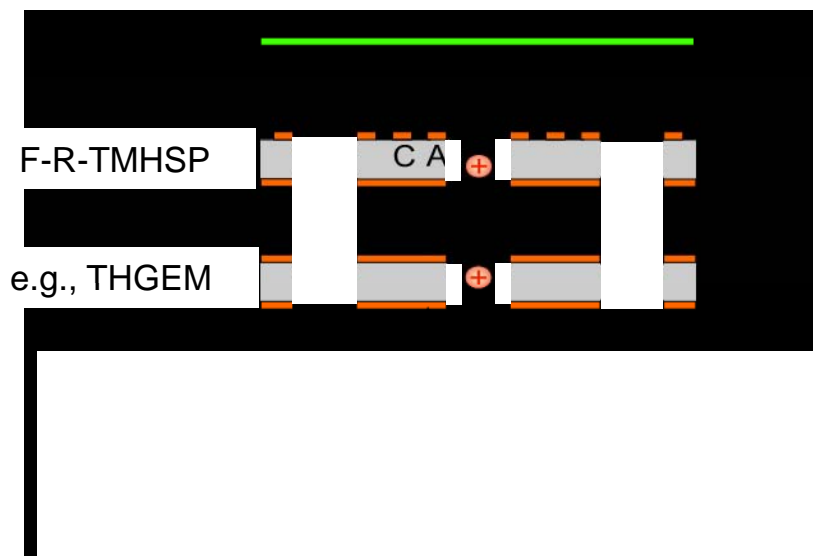
Energy response

- Spectrum obtained for a Cd-109 x-ray source @ a gain $\sim 10^4$



Preliminary IBF reduction capability with Garfield

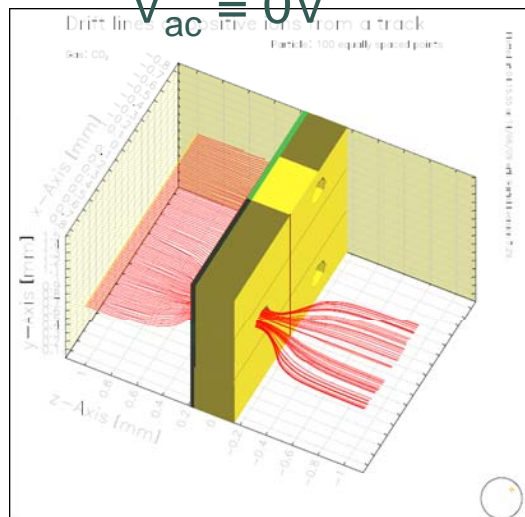
- Pure Ar @ 1bar - $V_{\text{hole}}=1200\text{V}$



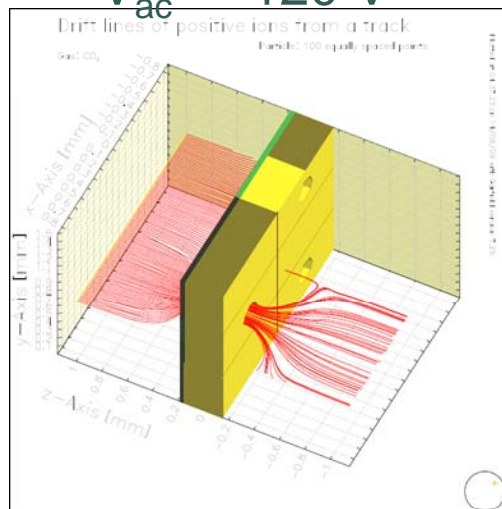
Preliminary IBF reduction capability simulation (Garfield)

- Pure Ar @ 1bar - $V_{\text{hole}} = 1200\text{V}$

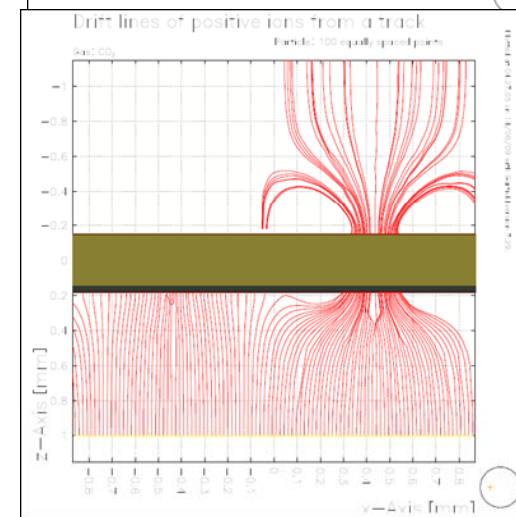
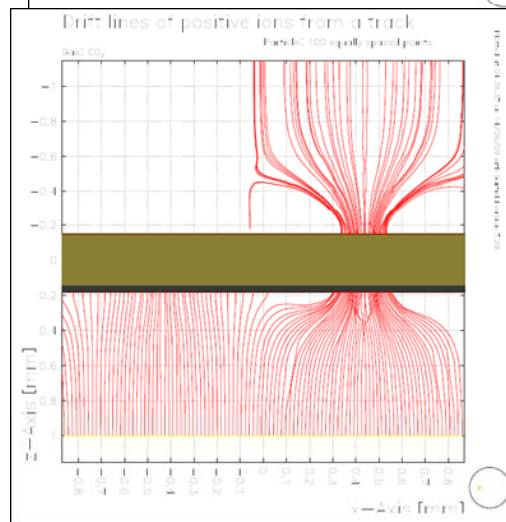
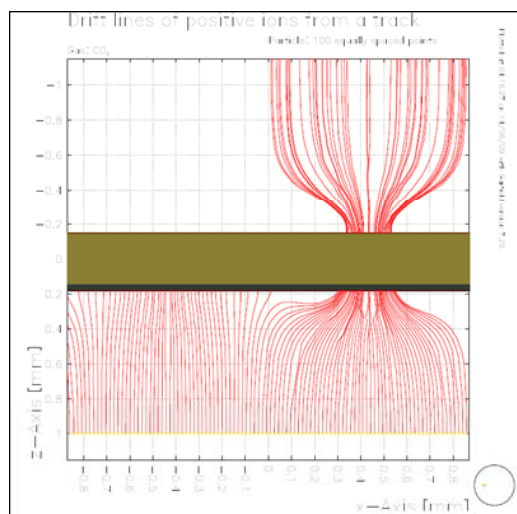
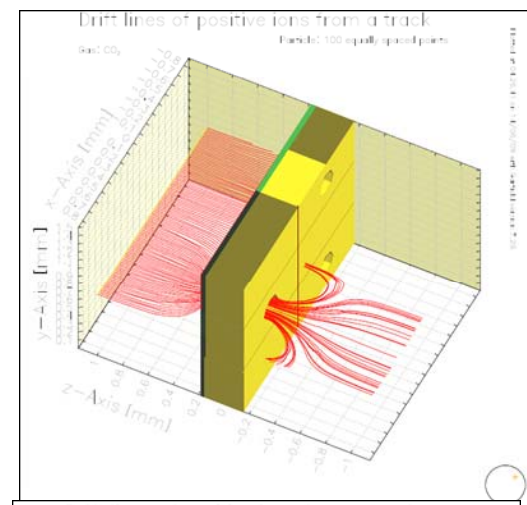
$V_{\text{ac}} = 0\text{V}$



$V_{\text{ac}} = -120\text{V}$



$V_{\text{ac}} = -300\text{V}$



Conclusions & future work

Both, experimental and simulation results are in course

GAIN

- Good gas gains were observed in current and pulse modes for the different studied gases. Comparable with double Thick-GEM.
- Good single photon detection was observed.
- More studies are needed for better understanding the avalanche development and the resulting gain increase when polarizing the extra electrode.

IBF

- GPMs operating in Thick-GEM cascades: semitransparent or reflective PCs.
- Experimental studies of:
 - IBF,
 - collection efficiency and;
 - gain.

Using the Th-structure in reverse mode or flipped reverse mode are in course.

- Preliminary simulation studies indicates that good IBF reduction could be possible.
- Depending on the results for IBF, this structure will allow to increase the lifetime of this photodetectors in the same order of magnitude as the out-coming results for the IBF reduction.

Thanks for your attention

