R&D on Plasma-Etched Gas Electron Multipliers for X-ray Polarimetry in Space

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IFD 2025 - INFN Workshop on Future Detectors,
Sestri Levante,
17-19/03/2025,

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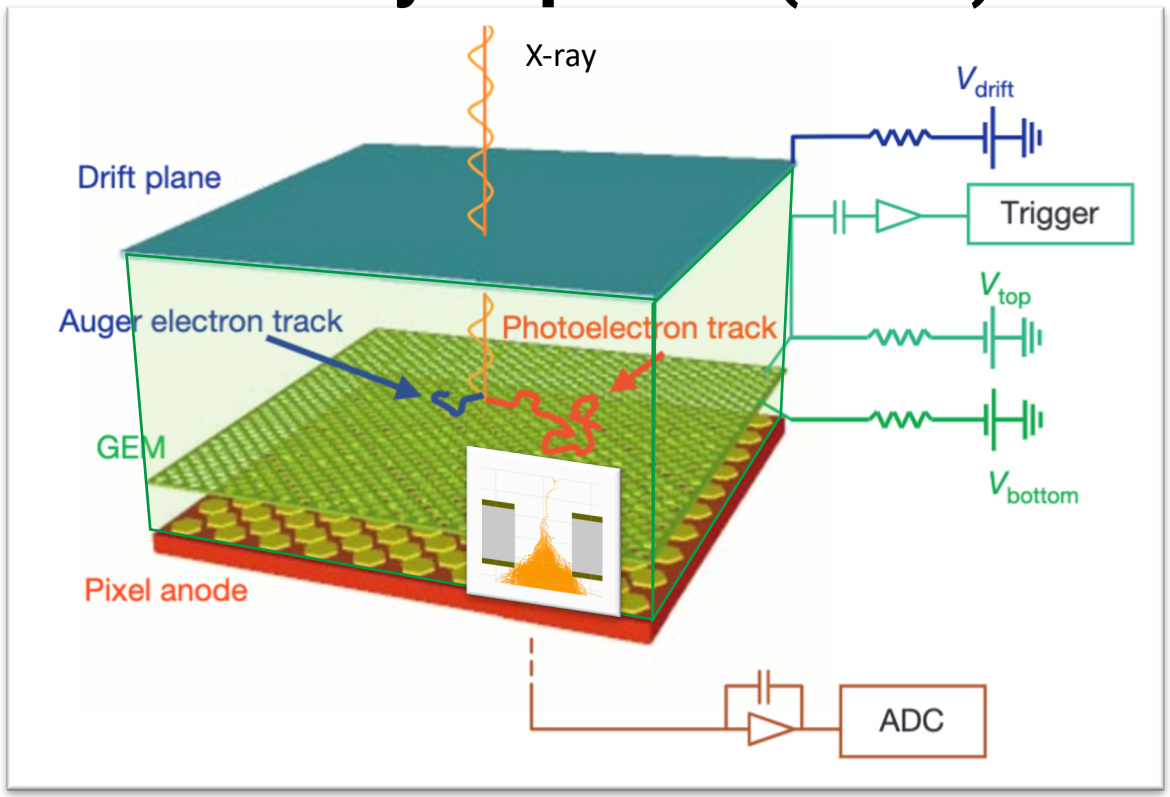
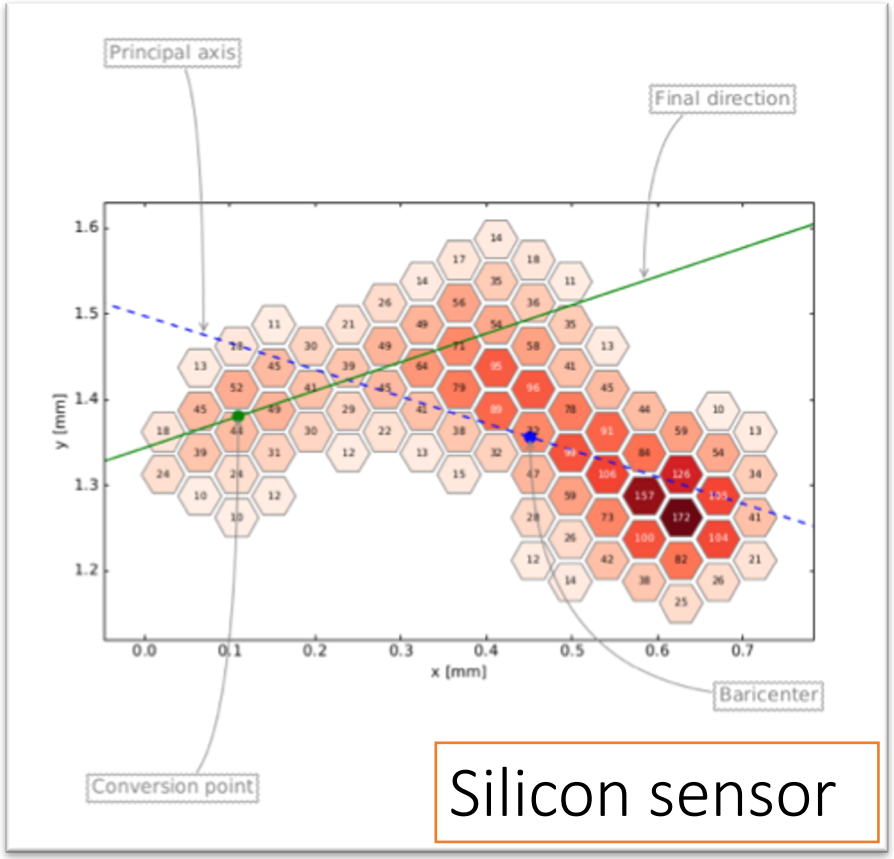
Gaseous Electron Multipliers

The Gas Pixel Detector (GPD) for the Imaging X-Ray Polarimetry Explorer (IXPE)

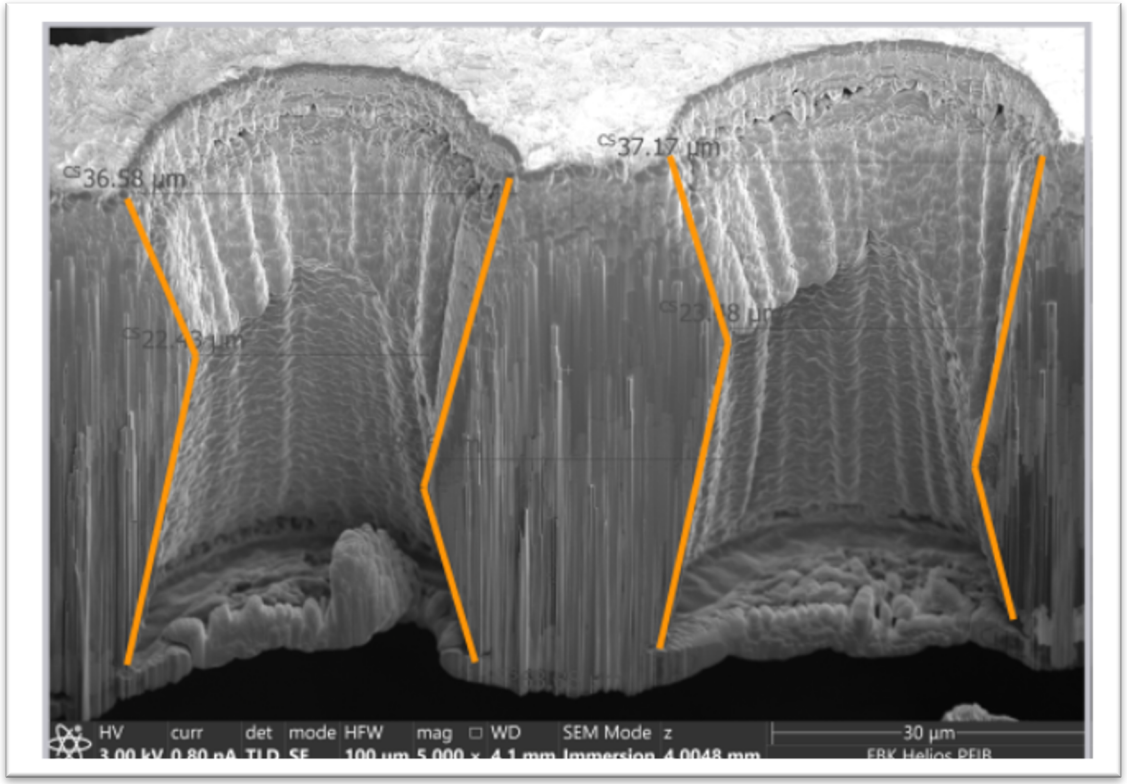


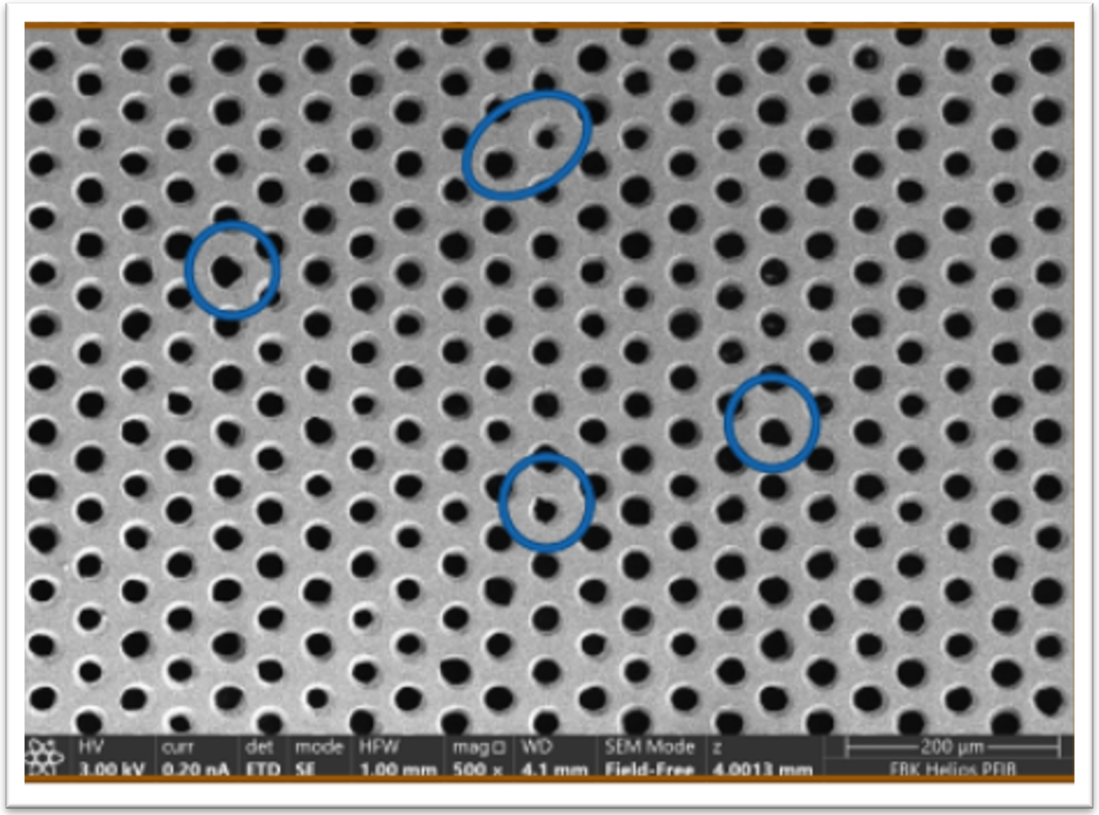


- Photoelectron direction -> X-ray polarisation
- Measure polarisation in space is difficult!
- Electron undergo multiple scattering!
- Direction is measured in the first 500 µm

Gaseous Electron Multipliers

IXPE GEM holes are not perfect!

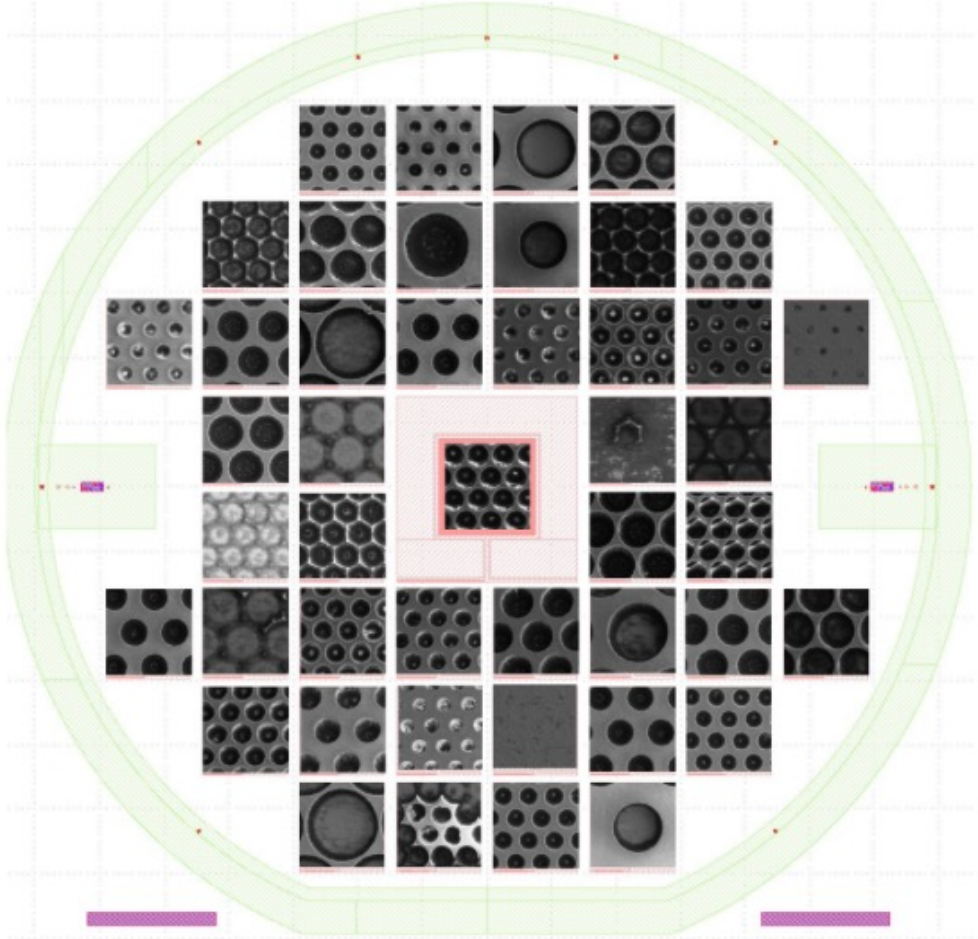




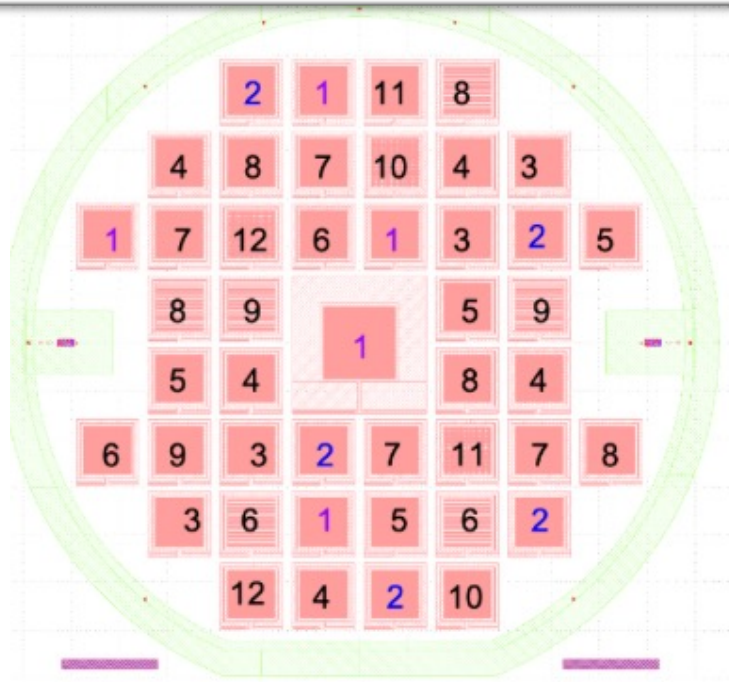
- Holes are not symmetric
- Diameters are not all equals!

Gaseous Electron Multipliers
GEM holes quality: can we do better?

- Plasma-based etching approach developed with the know-how of the FPCs
- Kapton 50 μm
- Copper 6 μm



Configuration	Hole diameter (μm)	Pitch (μm)	Replicates
1	11	50	4
2	14	50	5
3	19	50	4
4	24	50	5
5	29	50	4
6	34	80	4
7	34	80	5
8	44	80	5
9	59	150	4
10	59	150	4
11	84	150	5
12	109	150	2



Plasma-based etching approach for GEM detector microfabrication at FBK for X-ray polarimetry in space

Proceeding

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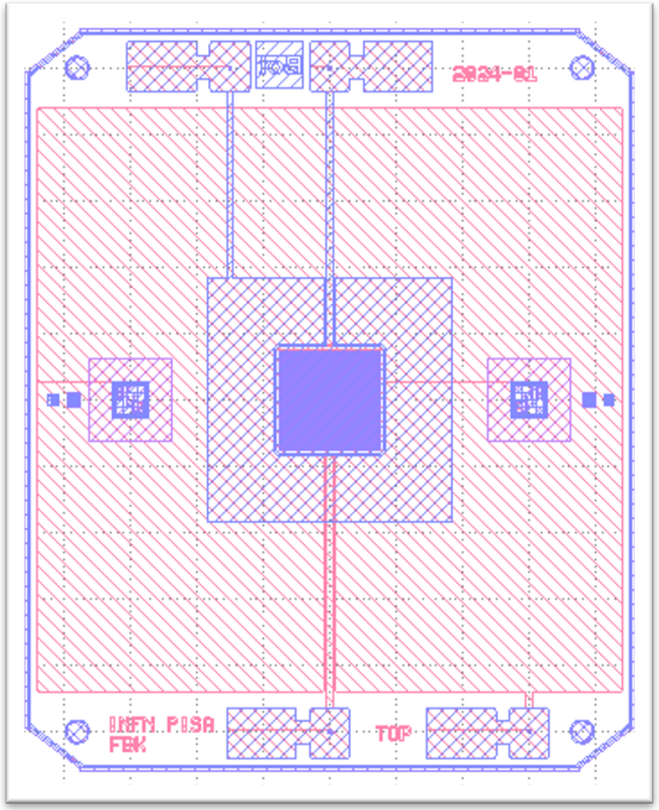
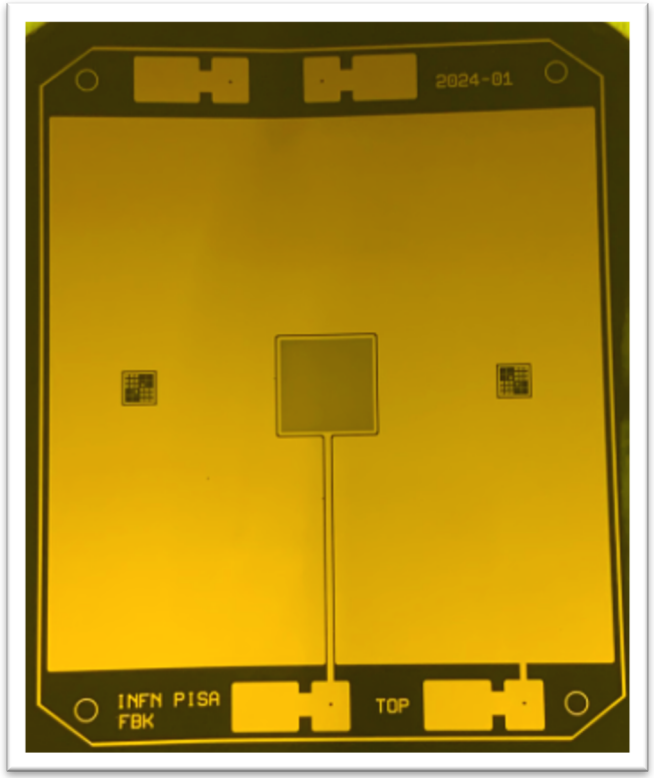
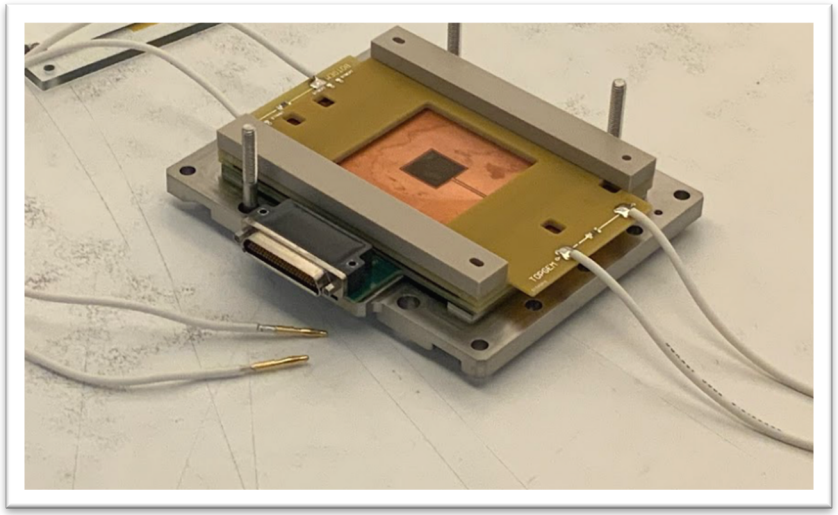
Gaseous Electron Multipliers
Full GEM design for IXPE



❑ Lithography mask design



❑ First lithography result



❑ Mechanical assembly with the manufactured GEM

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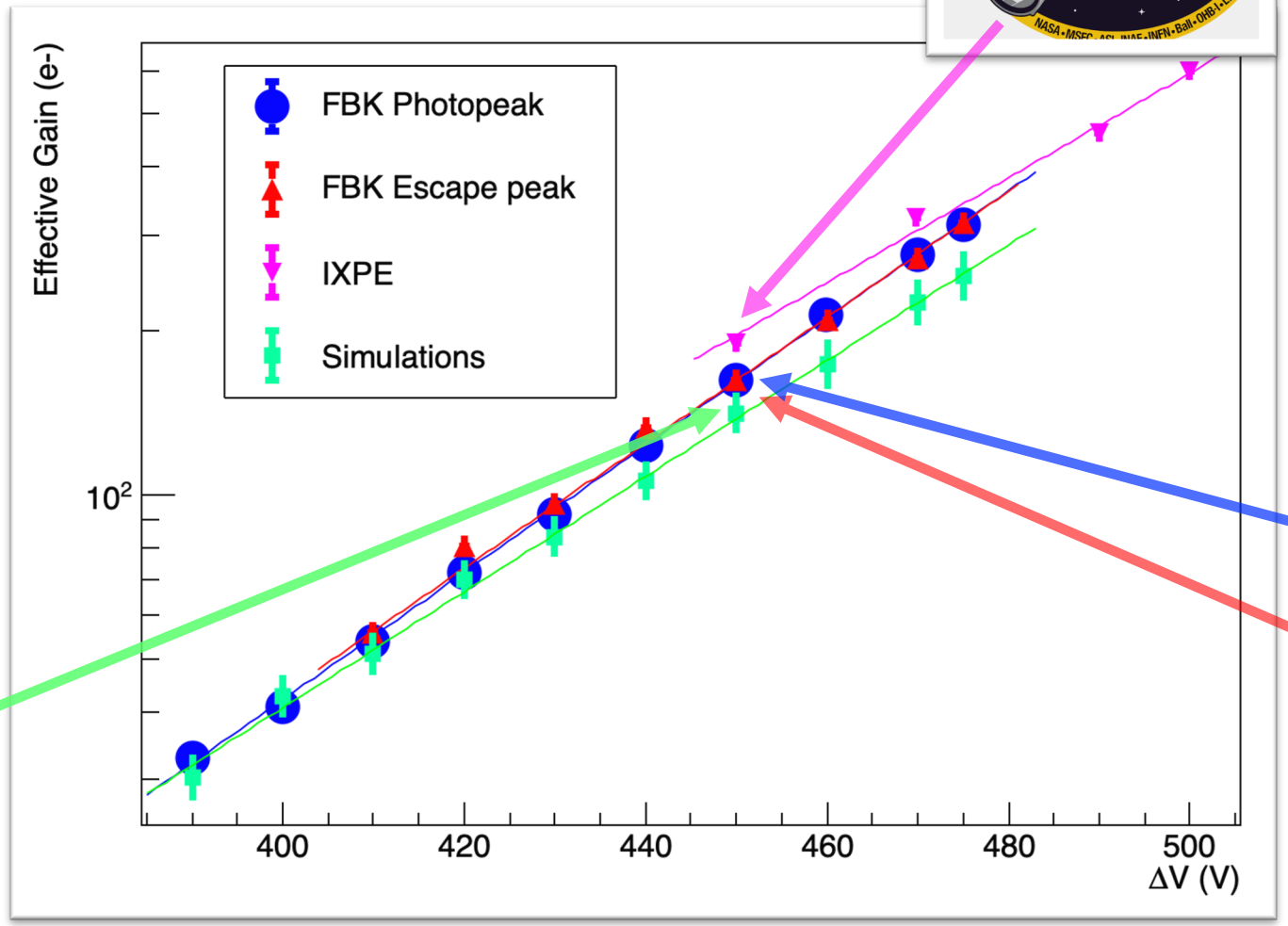
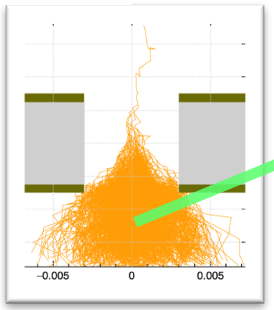
A. Lega[a,b,c,*] D. Novel[a] T. Facchinelli[a] C. Sgrò[d,e] L. Baldini[d,e] M. Minuti[d,e] M. Boscardin[a] G. Pepponi[a] R. Iuppa[b,c] R. Hall-Wilton[a] and L. Latronico[d,e]

Gaseous Electron Multipliers
Full GEM design for IXPE



- SIMILAR GAIN CHARACTERISTICS TO THE ONE MOUNTED IN IXPE!



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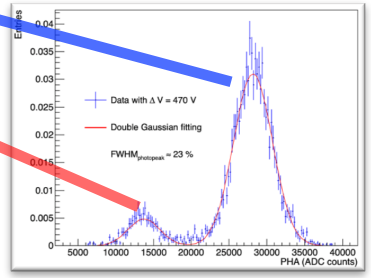

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Thanks for the attention!

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