

High resolution TPC based on optically readout GEM



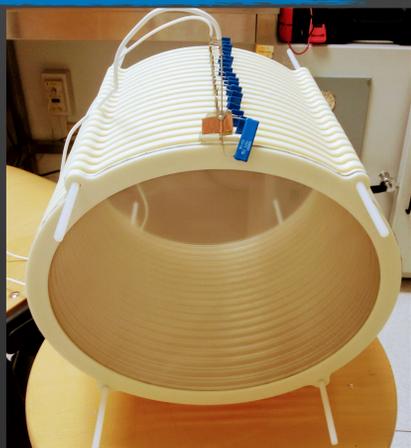
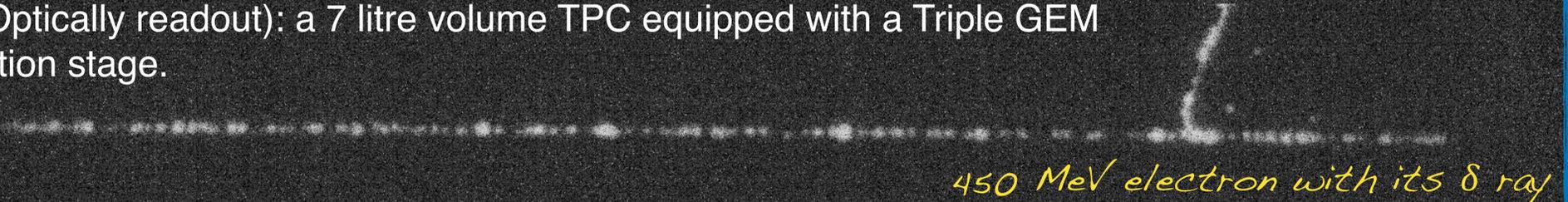
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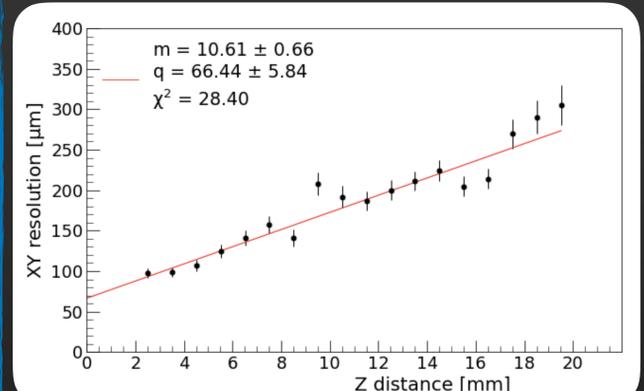
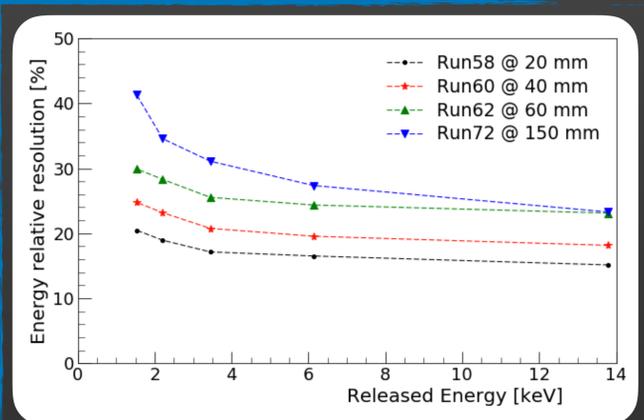
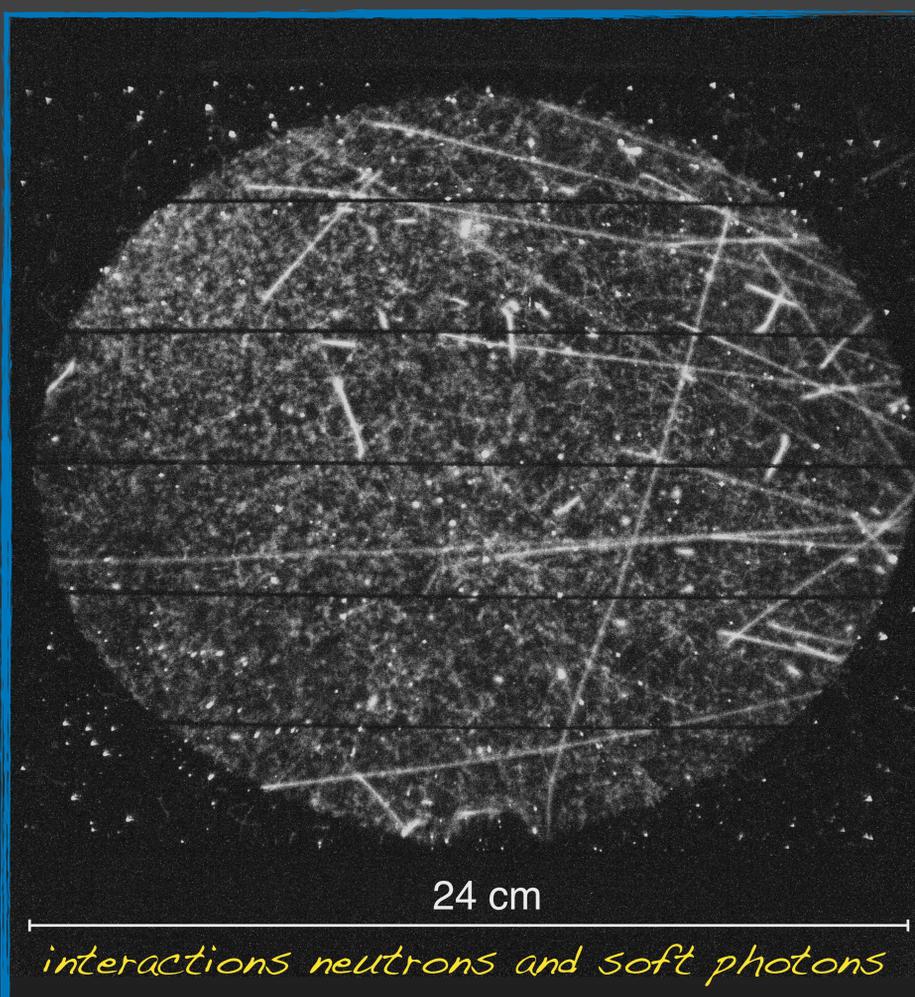


Large granularity and high sensitivity commercial CMOS sensors open the possibility of developing particle detectors for different applications, from the search of dark matter directional candidates, to high quality trackers for medical applications.

The gas scintillation mechanisms was exploited to readout LEMON (Large Elliptical Module Optically readout): a 7 litre volume TPC equipped with a Triple GEM amplification stage.



Elliptical field cage with a semi-transparent cathode and a triple 20x24 cm² GEM.



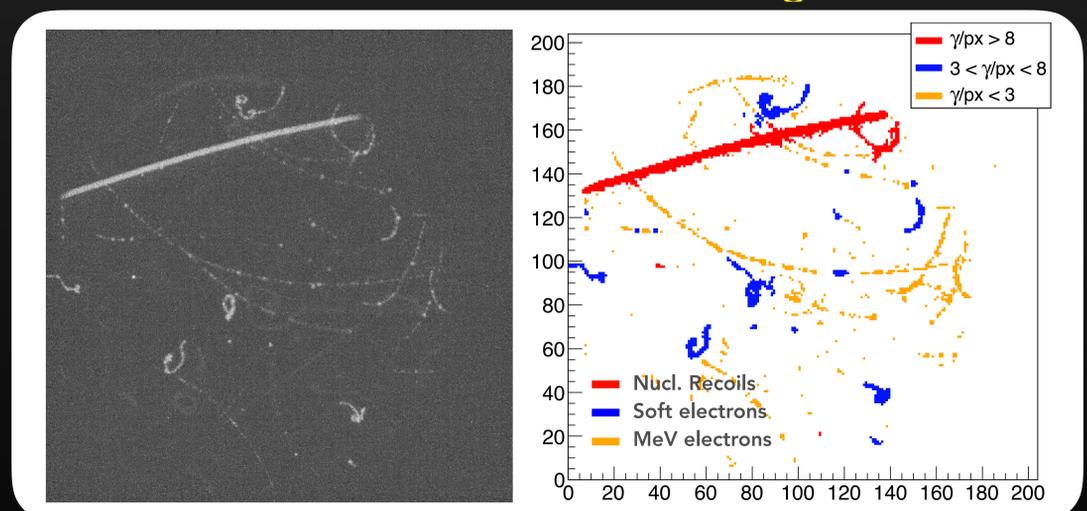
Space and Energy resolutions were evaluated with mips as a function of the distance from the GEM

A prototype with 1 centimetre sensitive gap was exposed to an Am-Be source providing:

- 1-10 MeV neutrons;
- 4 MeV photons;
- 60 keV photons;

A dE/dx analysis allows to discriminate between particles. By assigning different colours to clusters as a function of their average light density, the three species are almost completely separated.

Tracks in presence of 0.2 T magnetic field



[1] V. C. Antochi *et al.*, "Combined readout of a triple-GEM detector," JINST **13** (2018) no.05,
 [2] E. Baracchini *et al.*, "Negative ion Time Projection Chamber operation with SF₆ at nearly atmospheric pressure," JINST **13** (2018) no.04, P04022
 [3] D. Pinci *et al.*, "Cygnus: development of a high resolution TPC for rare events," PoS **EPS HEP2017** (2017) 077.
 [4] M. Marafini *et al.*, "ORANGE: A high sensitivity particle tracker based on optically read out GEM," NIM A **845** (2017) 285.
 [5] M. Marafini *et al.*, "Optical readout of a triple-GEM detector by means of a CMOS sensor," NIM A **824** (2016) 562.