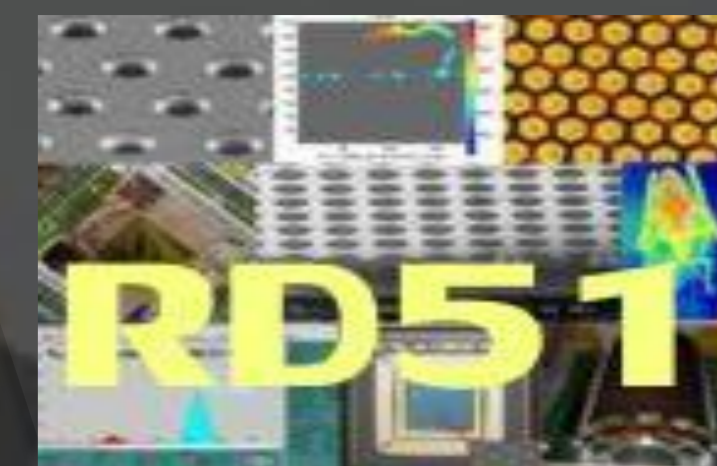
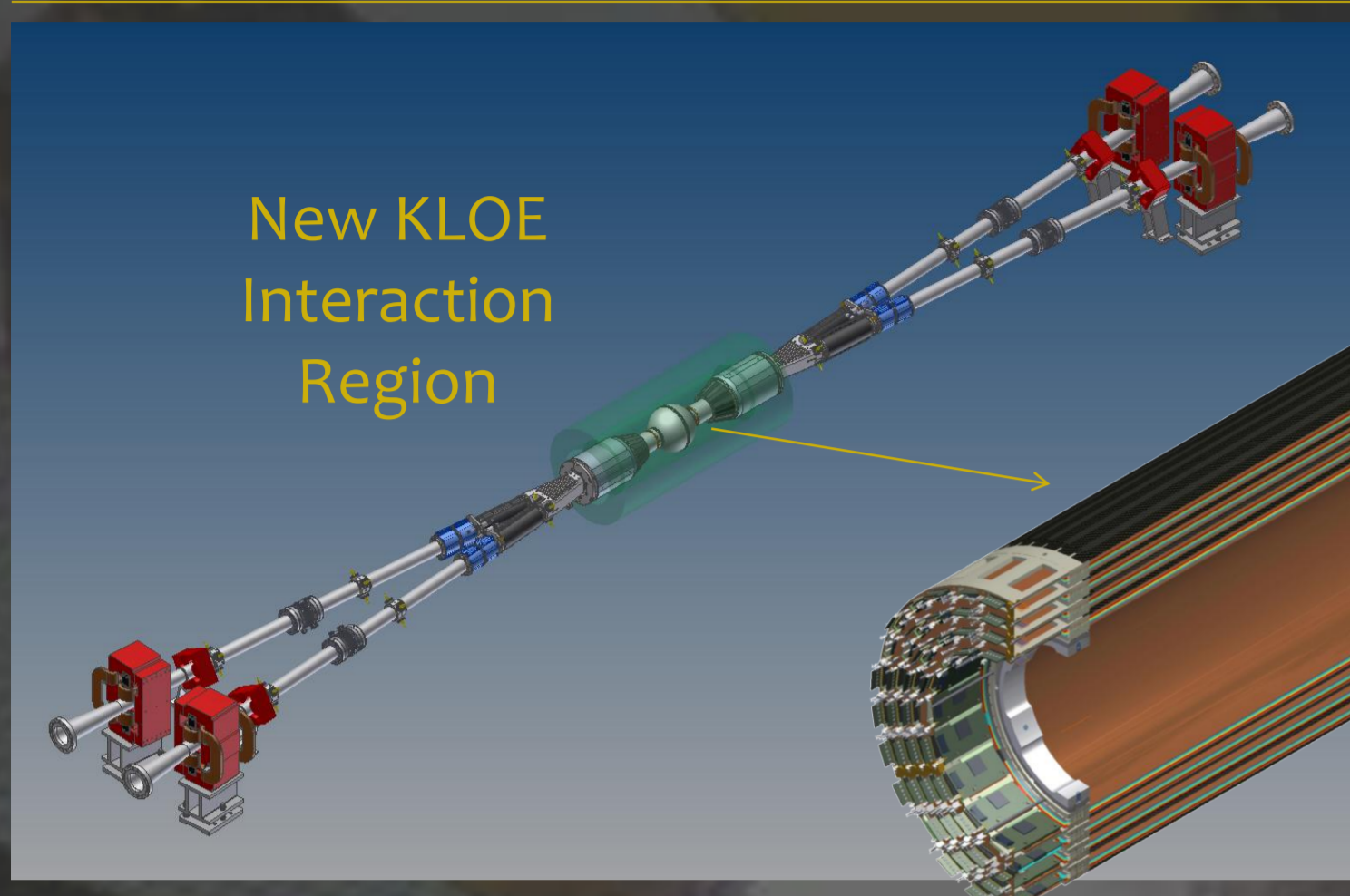




Production and test of the first 2 layers of the KLOE-2 Inner Tracker



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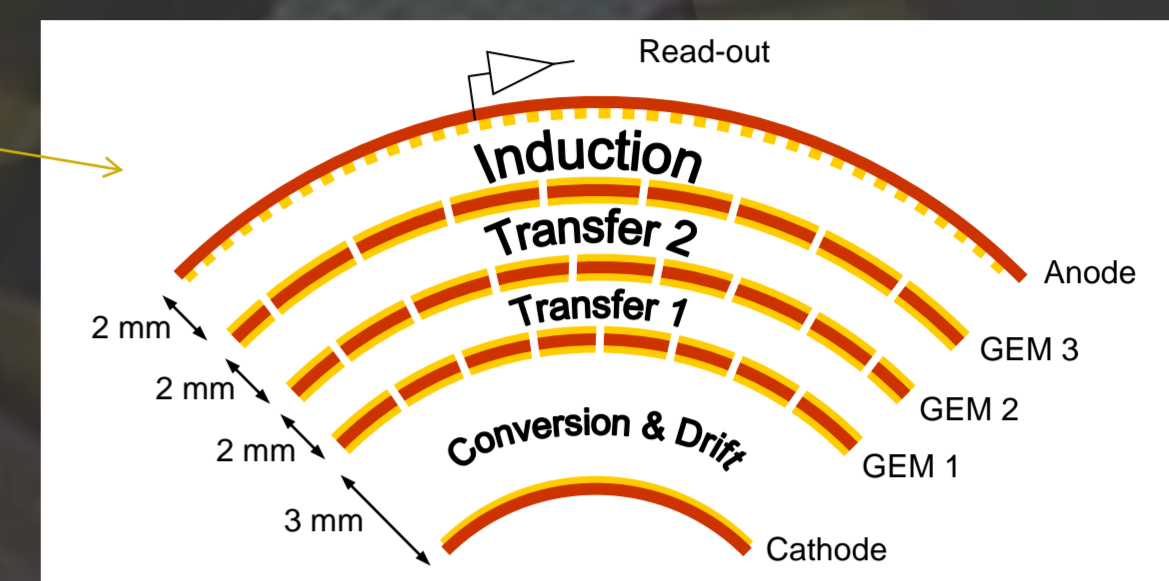


New KLOE Interaction Region

The KLOE experiment at the DAFNE Φ -factory will be upgraded with a new Inner Tracker composed by 4 tracking layers with radii of 130 / 155 / 180 / 205 mm around the Interaction Point.

Each layer is a **Cylindrical Triple-GEM detector**

All the 5 electrodes (Cathode, 3 GEMs and Readout) are realized as cylindrical polyimide foils. The innovative cylindrical design without frames in the active area allows to avoid dead spaces and to keep the material budget of the whole IT below 2% of X_0



The 2 innermost layers have been completed. The insertion inside KLOE is foreseen for Autumn 2012. We describe the manufacturing procedures and we present the test results.

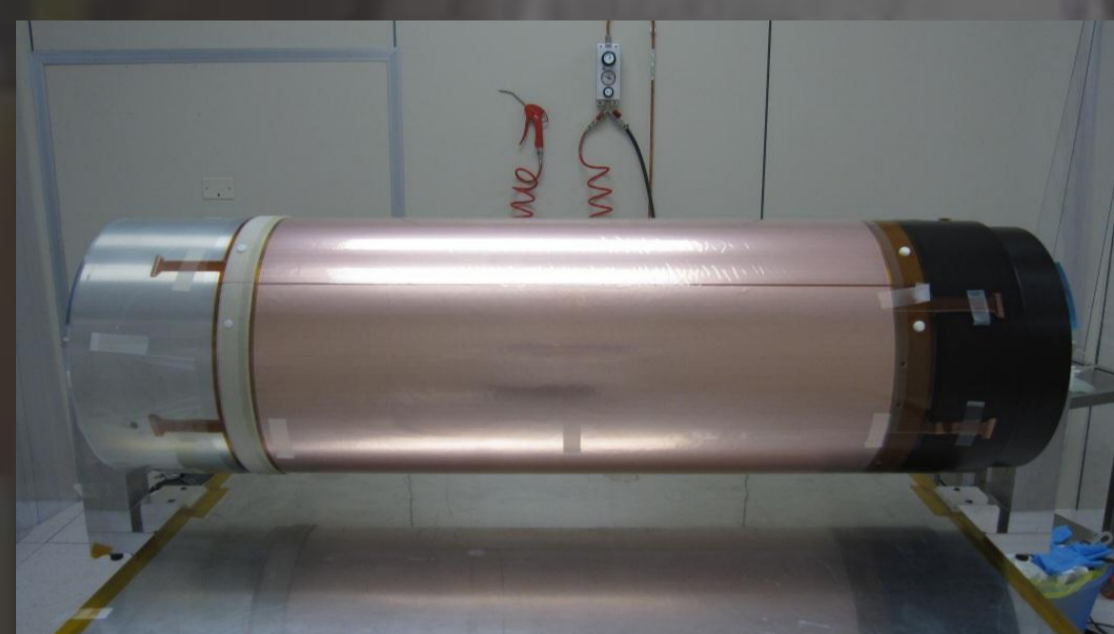
Manufacturing procedure of a cylindrical-GEM



3 GEM foils are spliced together to obtain a 100x70 cm² electrode...



... that is rolled on a cylindrical mold and enveloped in a vacuum bag.

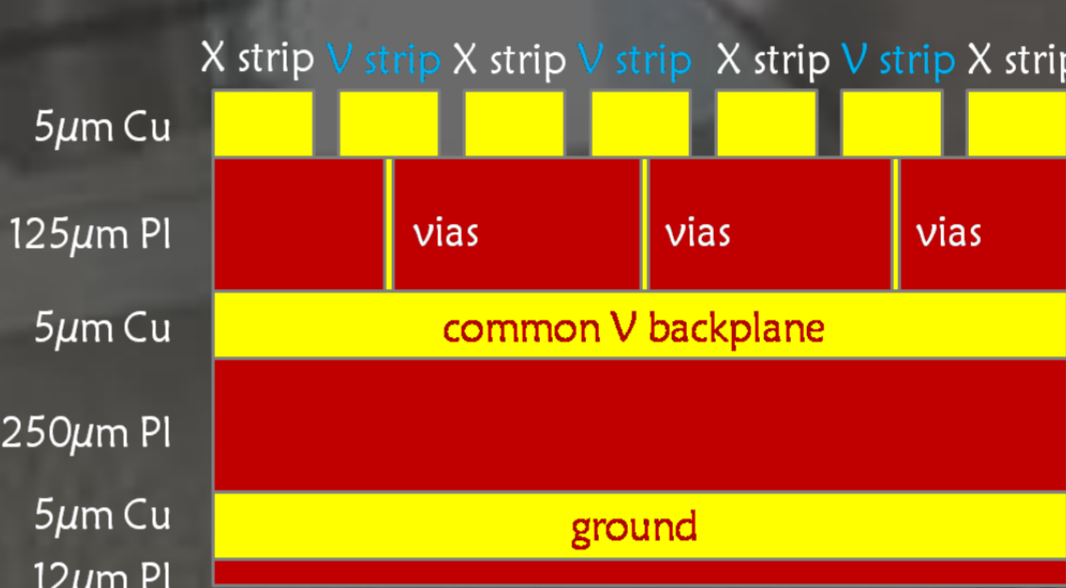


After the glue curing cycle the GEM is ready for the insertion...

... inside the Anode, performed with a linear bearing vertical machine



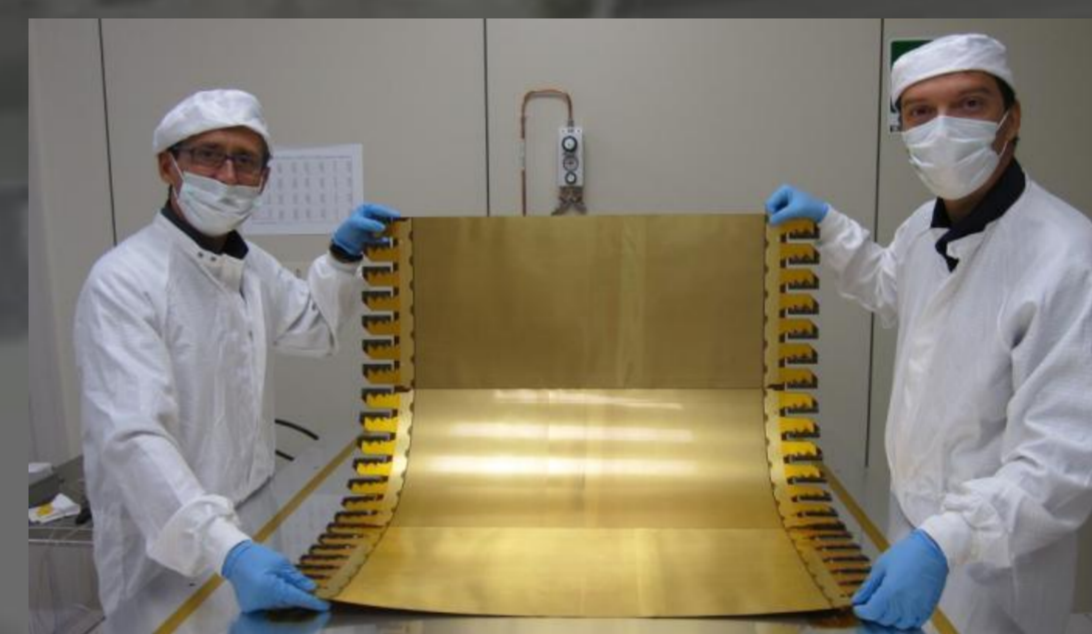
The Readout-anode of the cylindrical-GEM



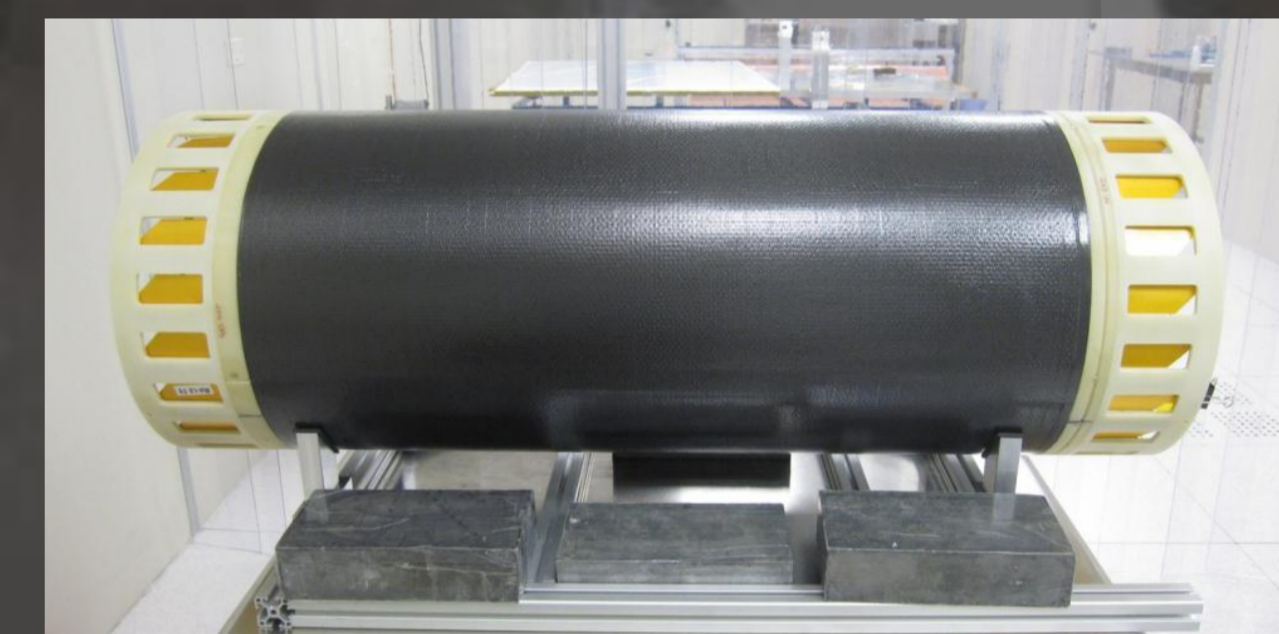
The readout is a multilayer flexible circuit on a polyimide substrate...



...providing a 2-dim point with XV strips at 650 µm pitch.



The final foil has 1.5k X strips and 3k V strips composed by 1M pads connected through internal vias



The electrode is shielded with a composite shell made by 2 Carbon skins (90 µm thick) and a Honeycomb foil (3 mm thick)

The GASTONE front-end chip

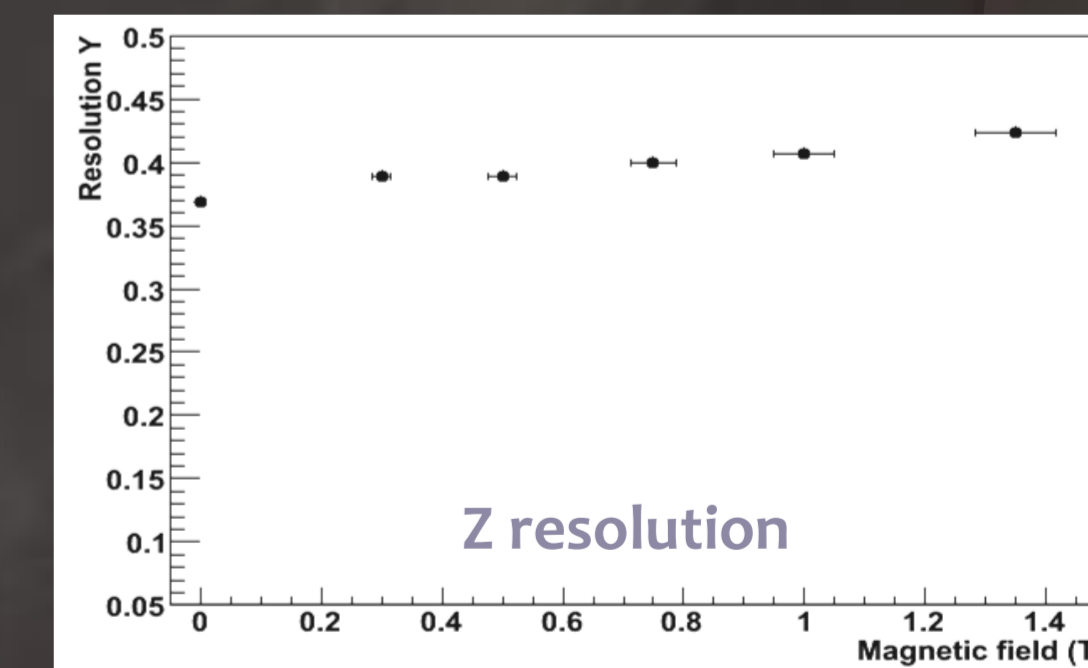
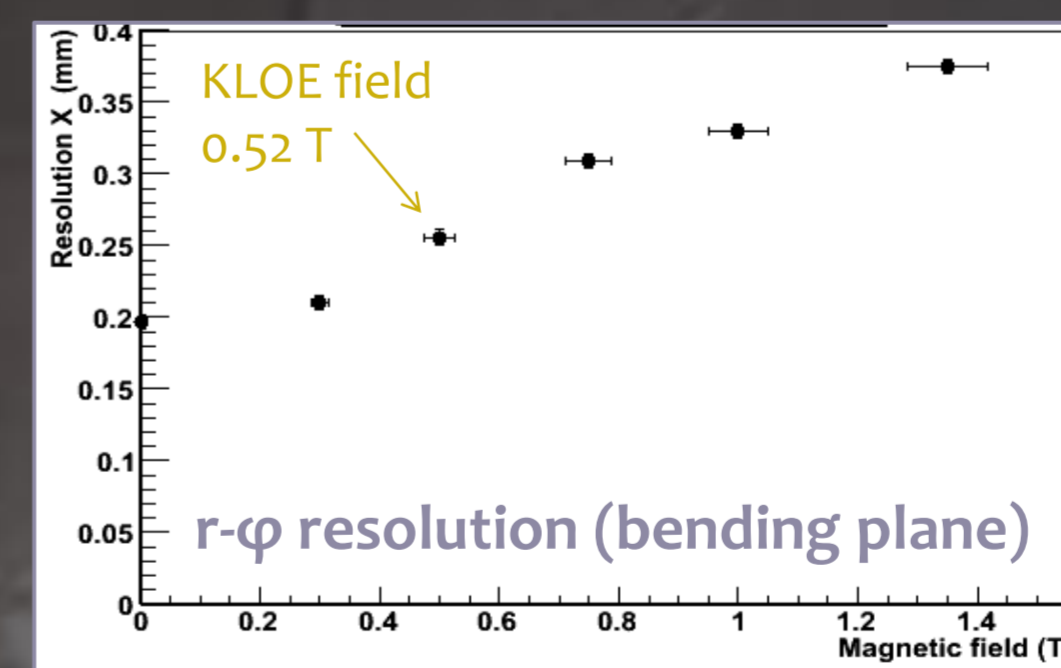
GASTONE is a charge amplifier, shaper, discriminator chip developed for the KLOE-2 Inner Tracker



Channels	64
Dimensions	4.5 X 4.5 mm ²
Input impedance	400 Ω
Sensitivity	22 mV/fC (Cdet = 0 pF)
Peaking time	80 ns±150 ns
Crosstalk	< 3%
ENC	800 e- + 40 e-/pF
Power cons.	~ 7.5 mW/ch
Readout	Serial LVDS (100 MBps)

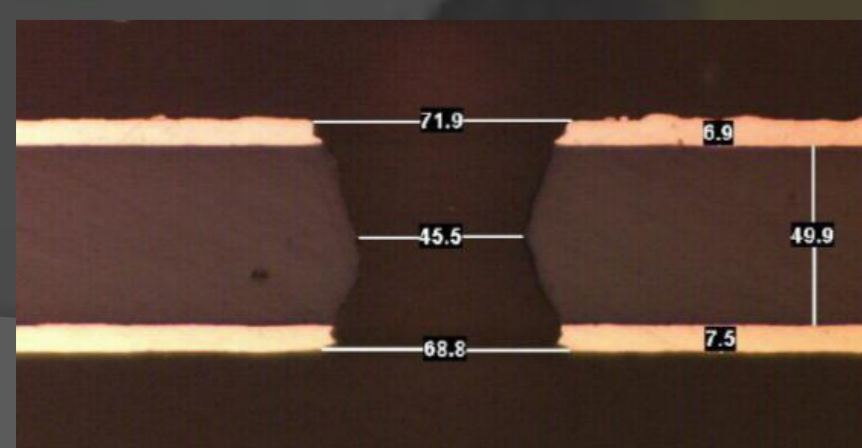
Performance in magnetic field

In order to reproduce the collider conditions we have tested a planar prototype in the magnetic field in the RD51 testbeam area at CERN H6. The spread of the charge due to the field affects the resolution in the bending plane

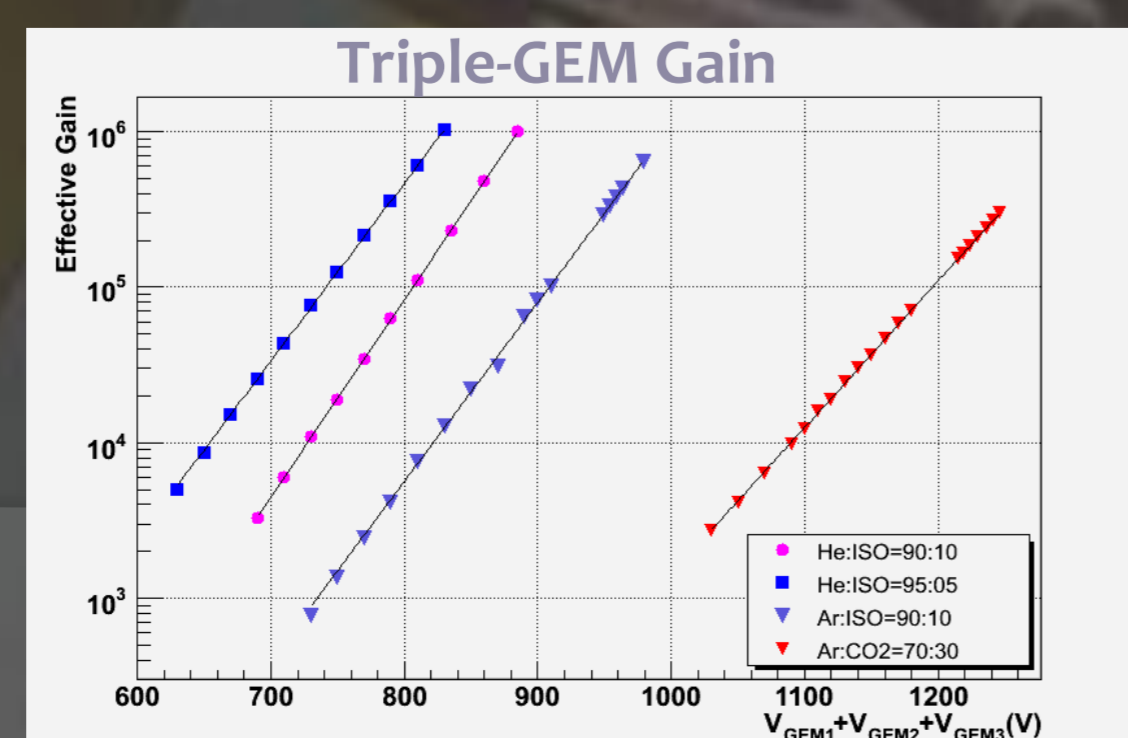


Gas gain measurements of single-mask GEM

The GEM foils are produced with a single-mask etching of the polyimide resulting in a slightly asymmetric shaped hole. We measured the gain of 4 different gas mixtures based on Argon and Helium. The final choice is Ar/Isobutane : 90/10.

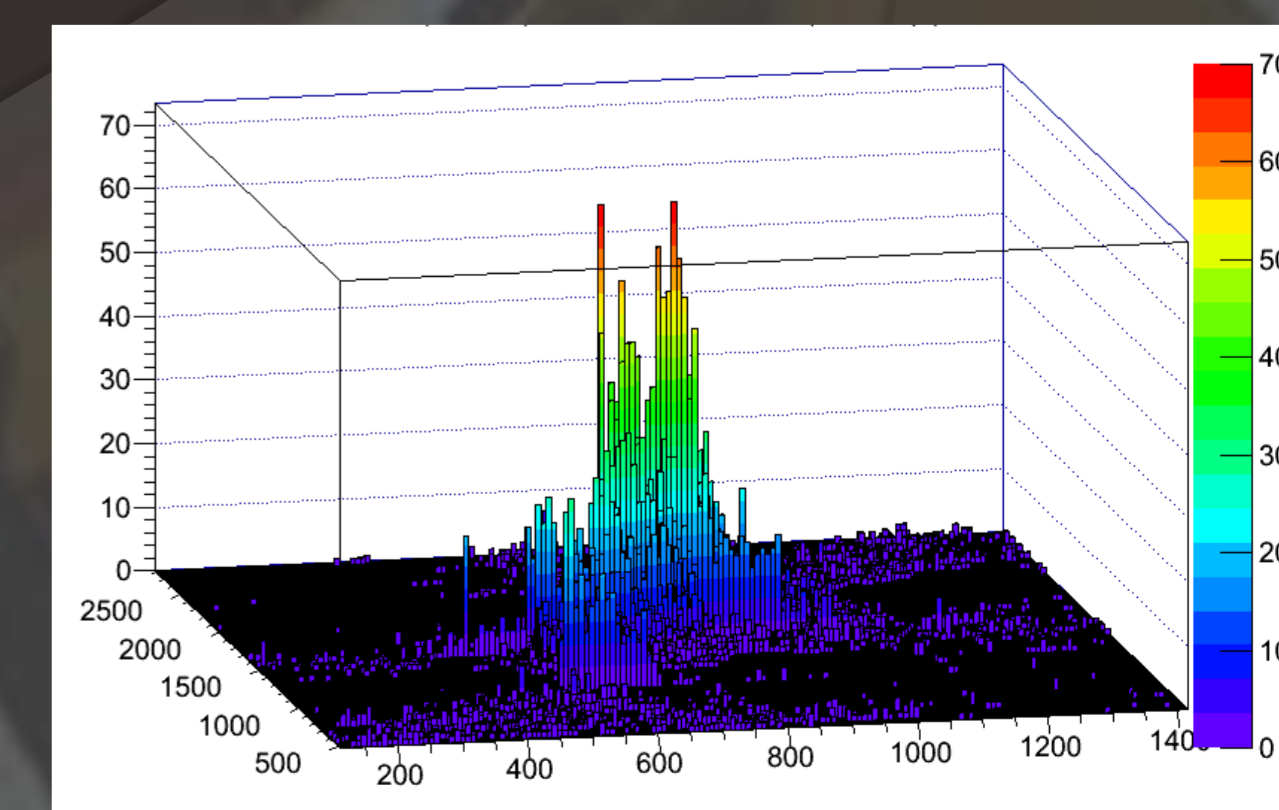
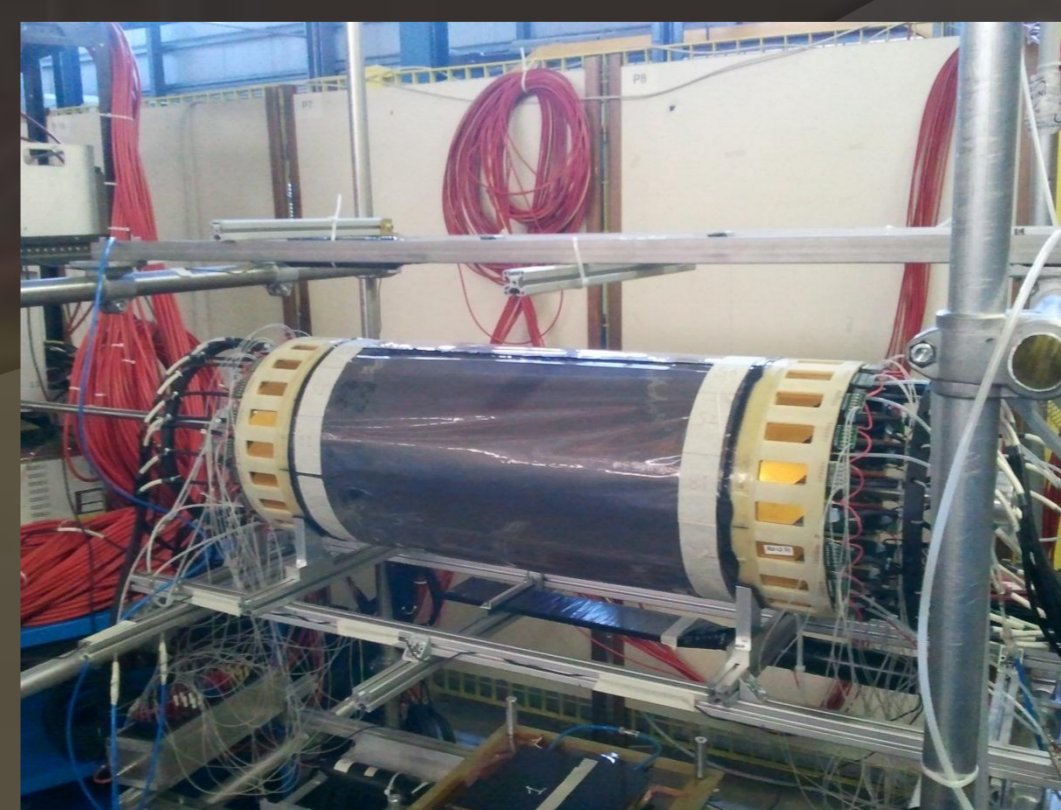


Single-mask GEM hole cross section



Test with β source

The Layer2 of the IT equipped with final electronics, DAQ and HV system under test with a ⁹⁰Sr source



Hit distribution of the source in the XV plane