Beam Test of LNF GEM chambers for readout study of KLOE2 Inner Tracker

WG7.28.04.09

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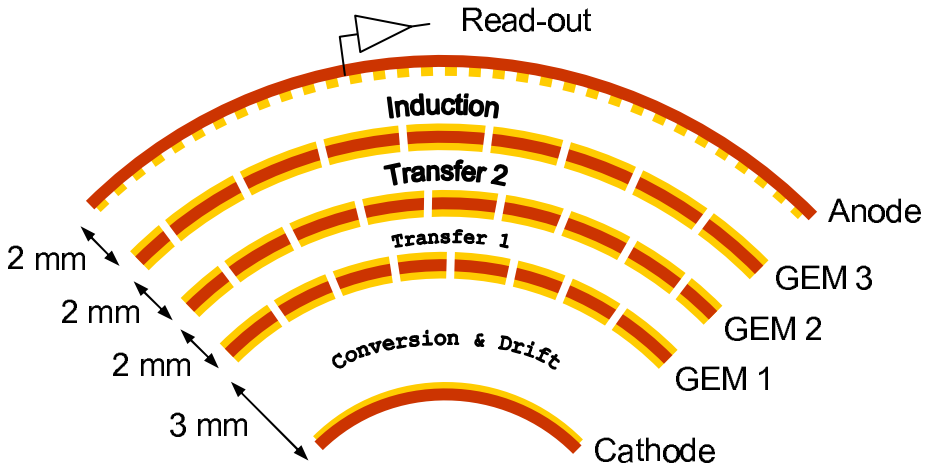
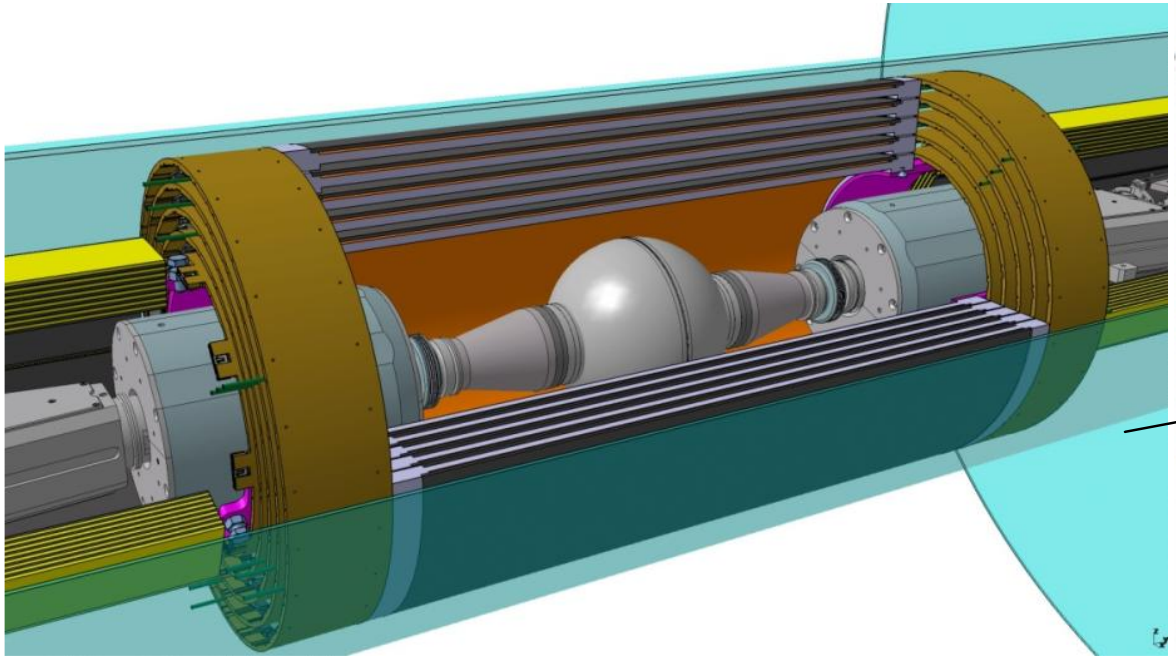
New Inner Tracker at KLOE2

- 5 independent tracking layers with $\sigma_{r\varphi}$ = 200μm, σ_Z = 500μm obtained with XV readout
- 700 mm active length and 150 to 250 mm radii
- 1.8% X_0 total radiation length in the active region
- Realized with **Cylindrical-GEM**

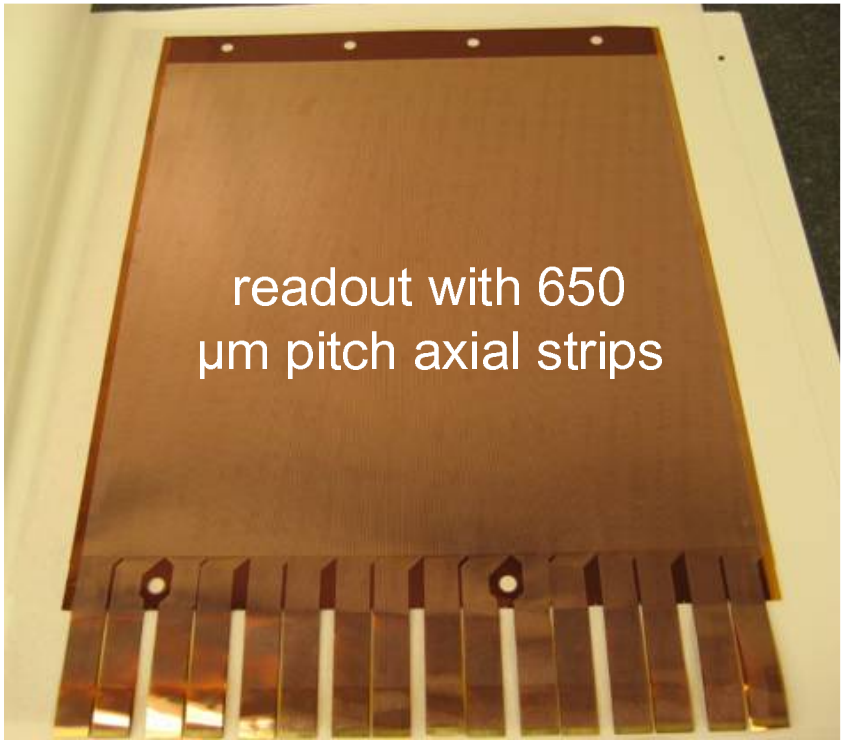
Cylindrical Triple GEM

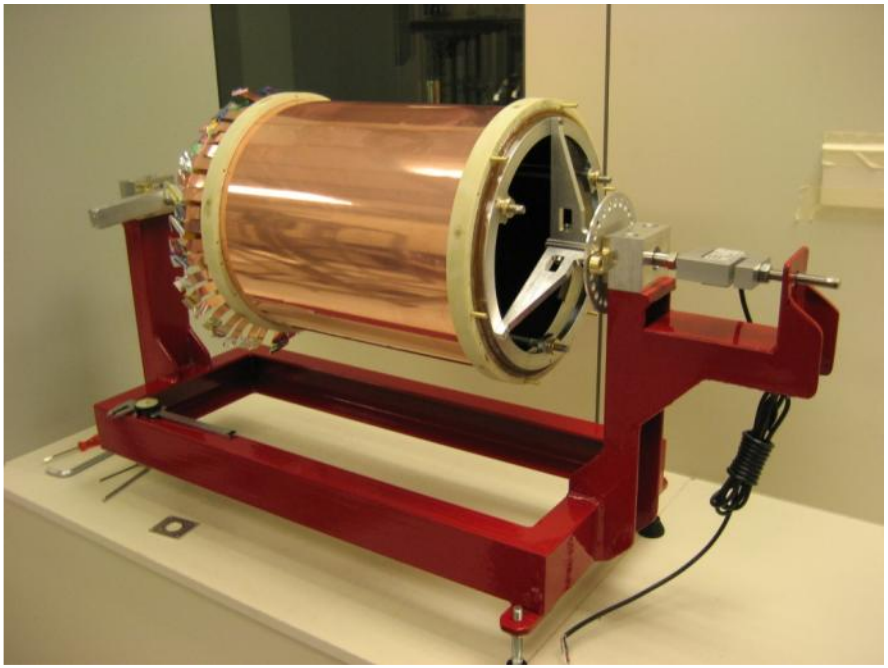


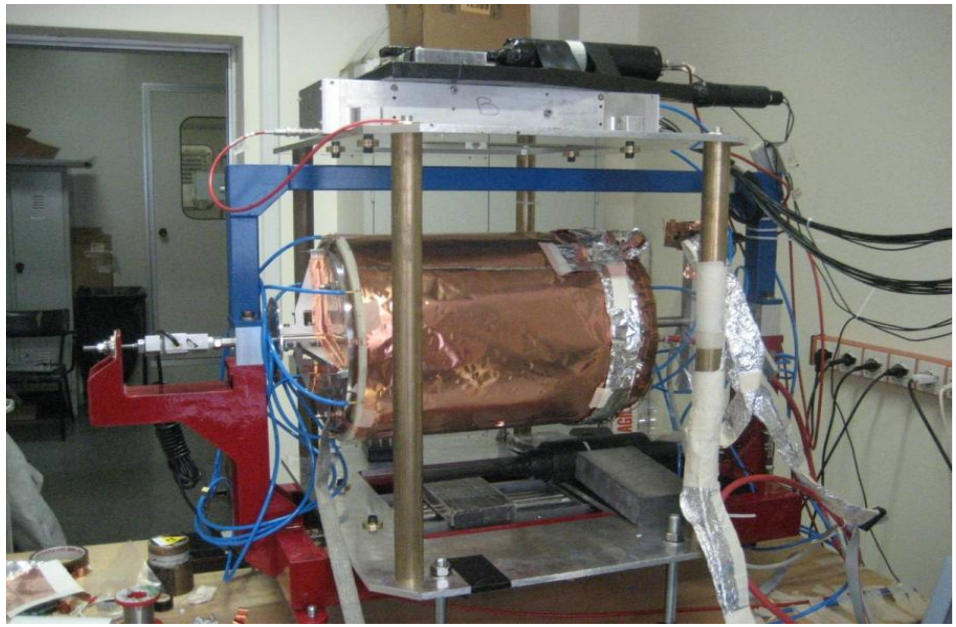


CGEM Prototype

- 150 mm radius x 352 mm active length
- readout anode with 1538 strips with 650 μm pitch only along Z
- Successfully tested with X-rays, Cosmics, pion beam at PS

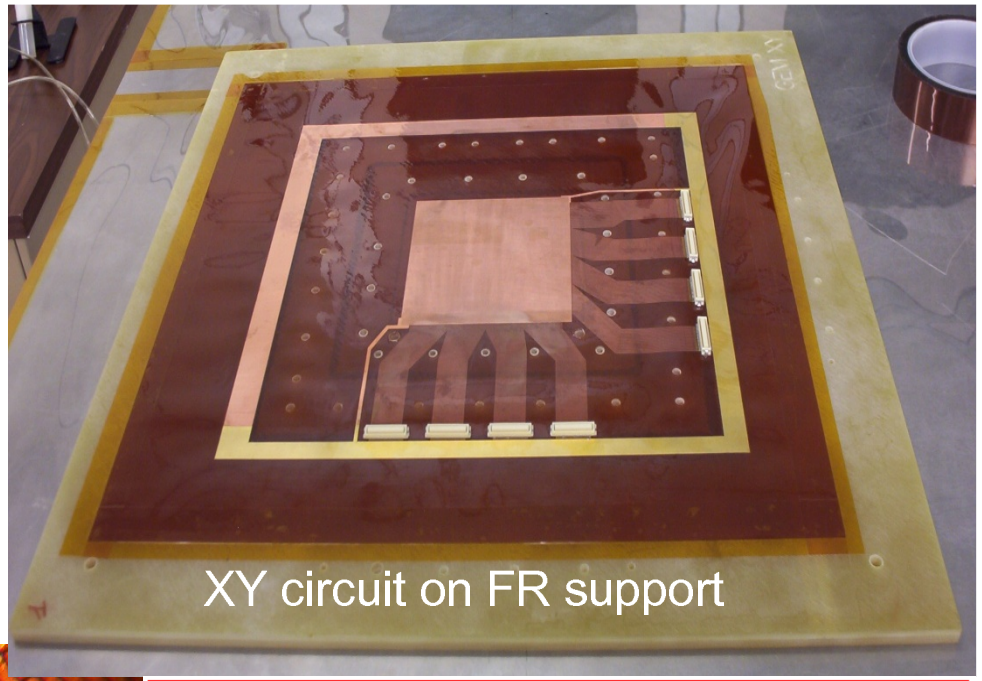


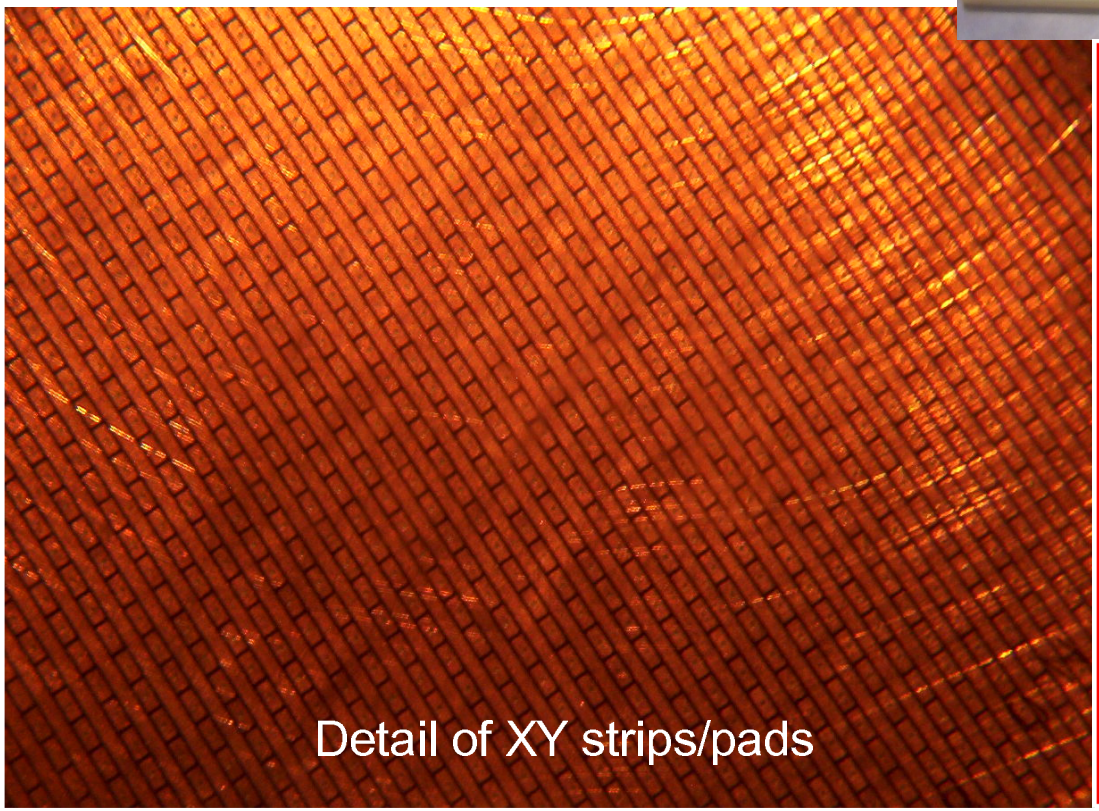


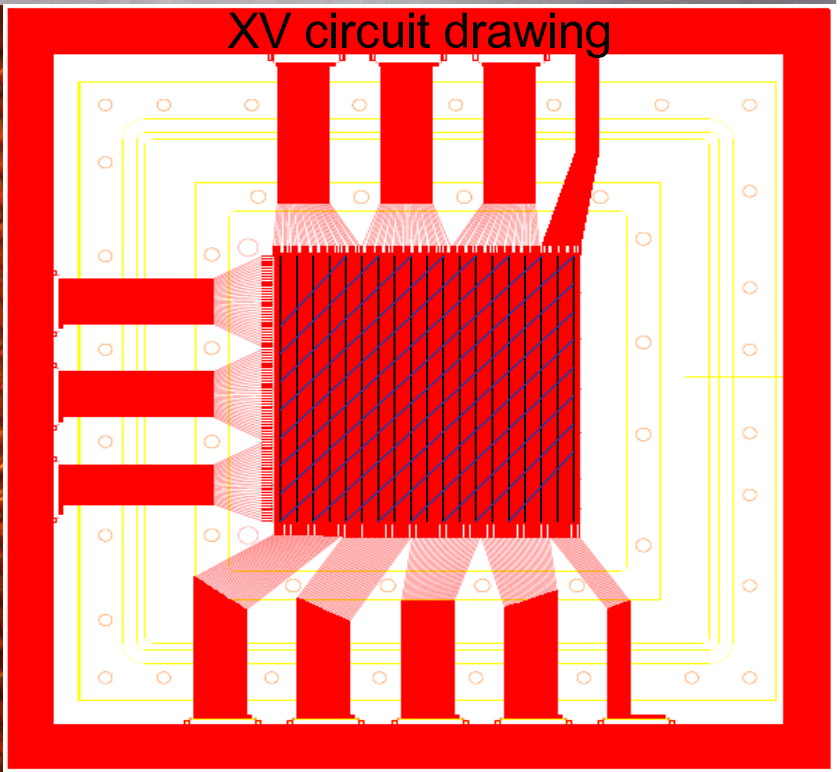


Dedicated Readout Studies

- Readout circuit with strips and pads engraved on the same Kapton foil
- Pads are connected through internal vias to form strips with the same pitch (650μm)
- 5 dedicated 10x10cm^2 Triple-GEM built: 4 with simpler **XY** pattern, 1 with final **XV**

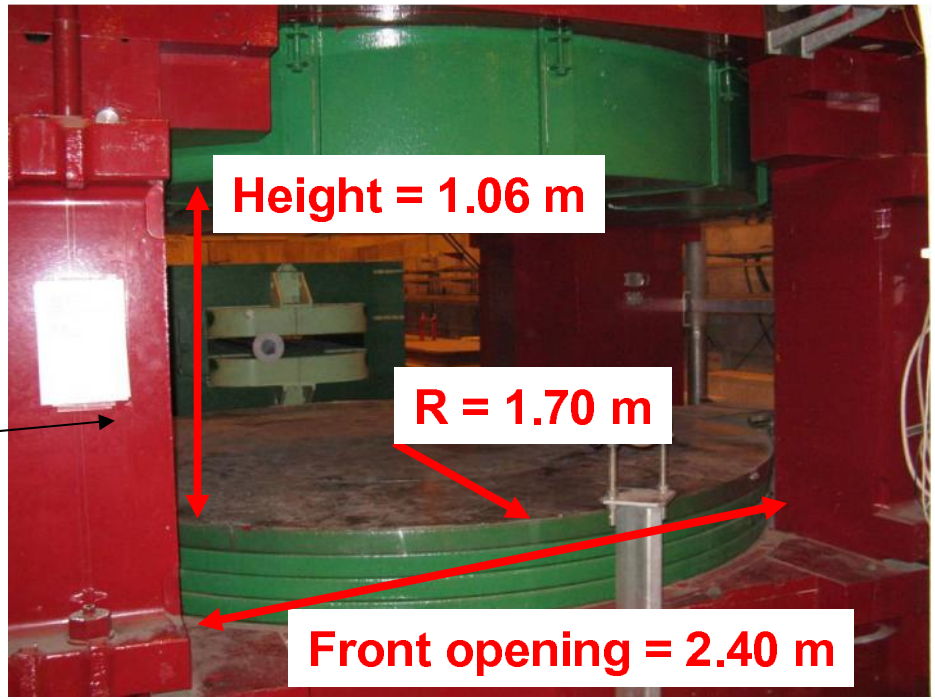

XY circuit on FR support

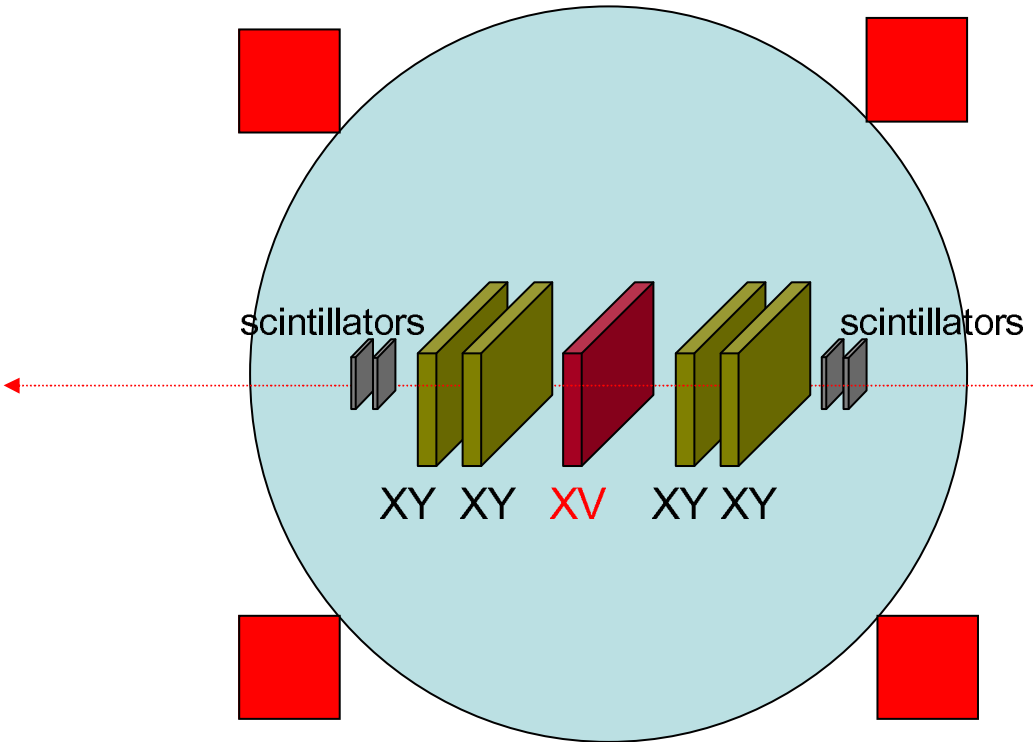

Detail of XY strips/pads



Testbeam Program

- Detailed study of XV readout pattern (efficiency, x-talk)
- Effects of magnetic field (Kloe B=0.52T) switching on the Goliath Dipole
- 4 XY chambers used for Tracking inside the magnetic field



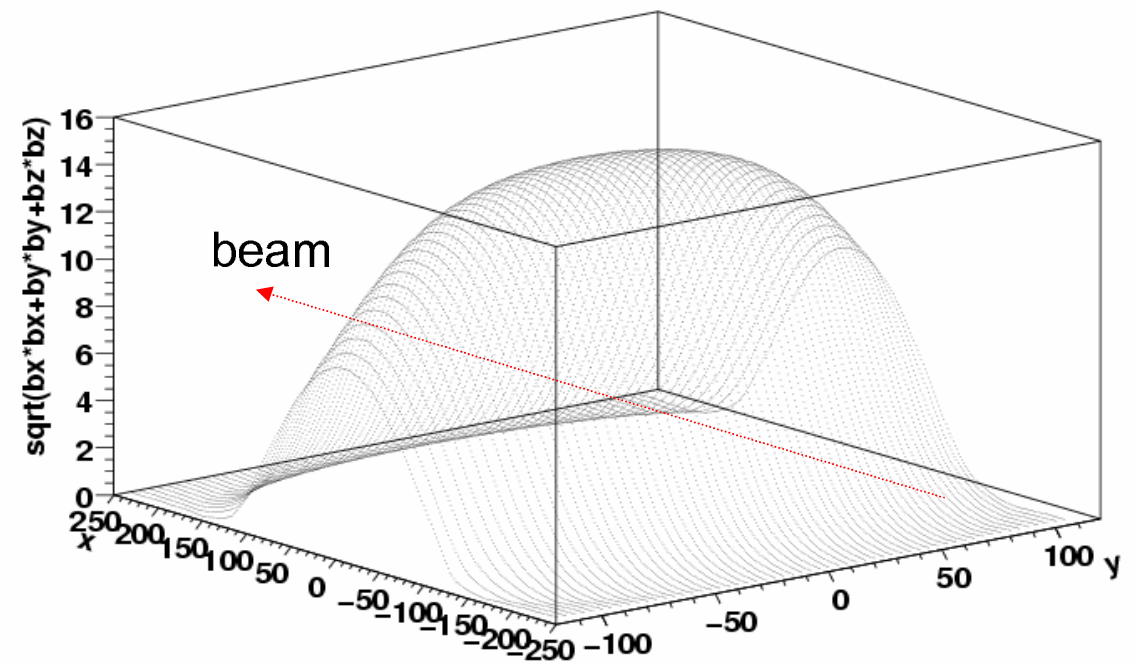


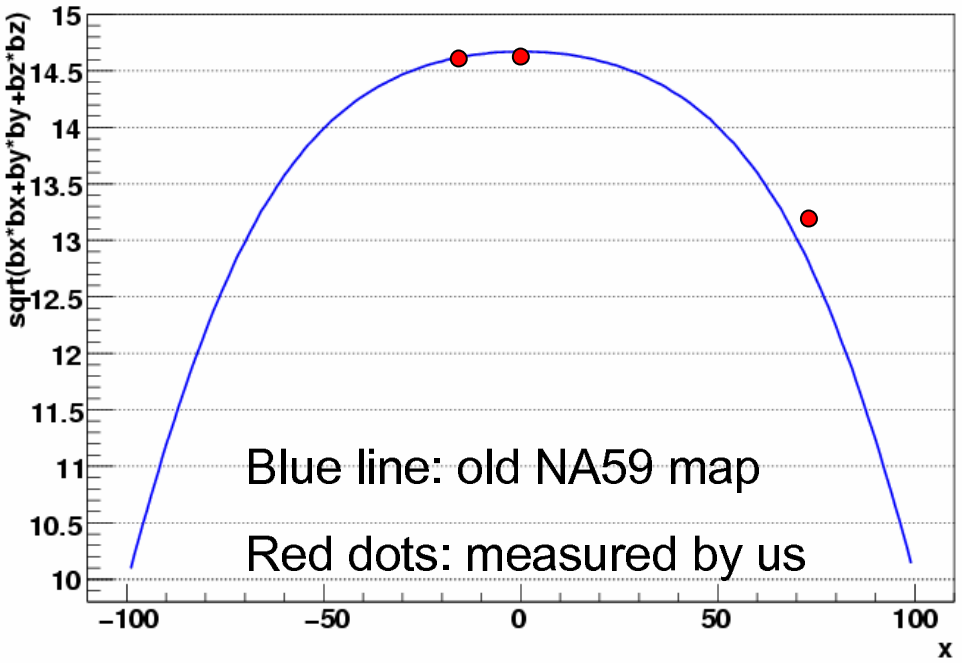
- Trigger provided by 4 plastic scintillators coupled to Hamamatsu PMT for Bfield
- Own dedicated HV/DAQ system on a rack inside the test area

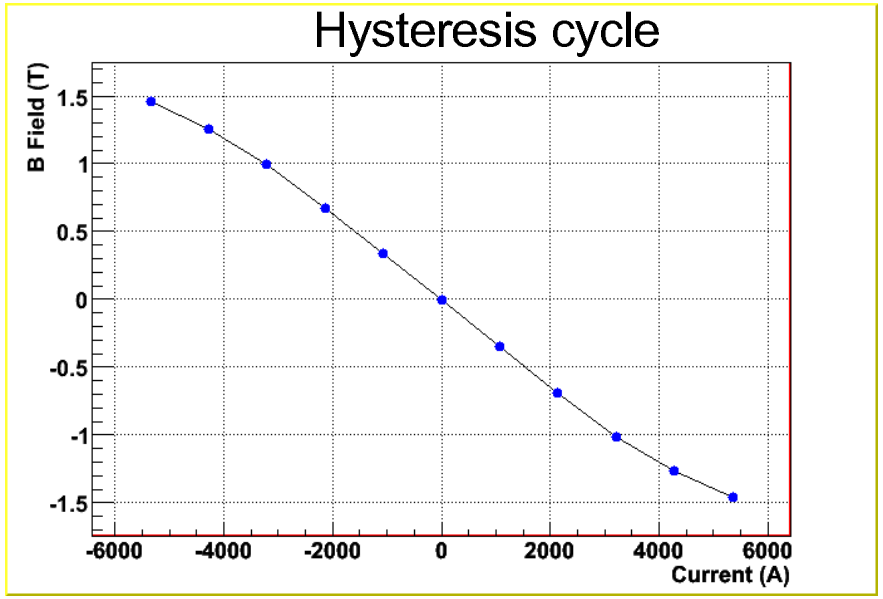
Requirements

- Ethernet cable to the barrack
- 4 gas lines: Ar, CO_2, He, Isobuthane
- Plate to fix the support mechanics

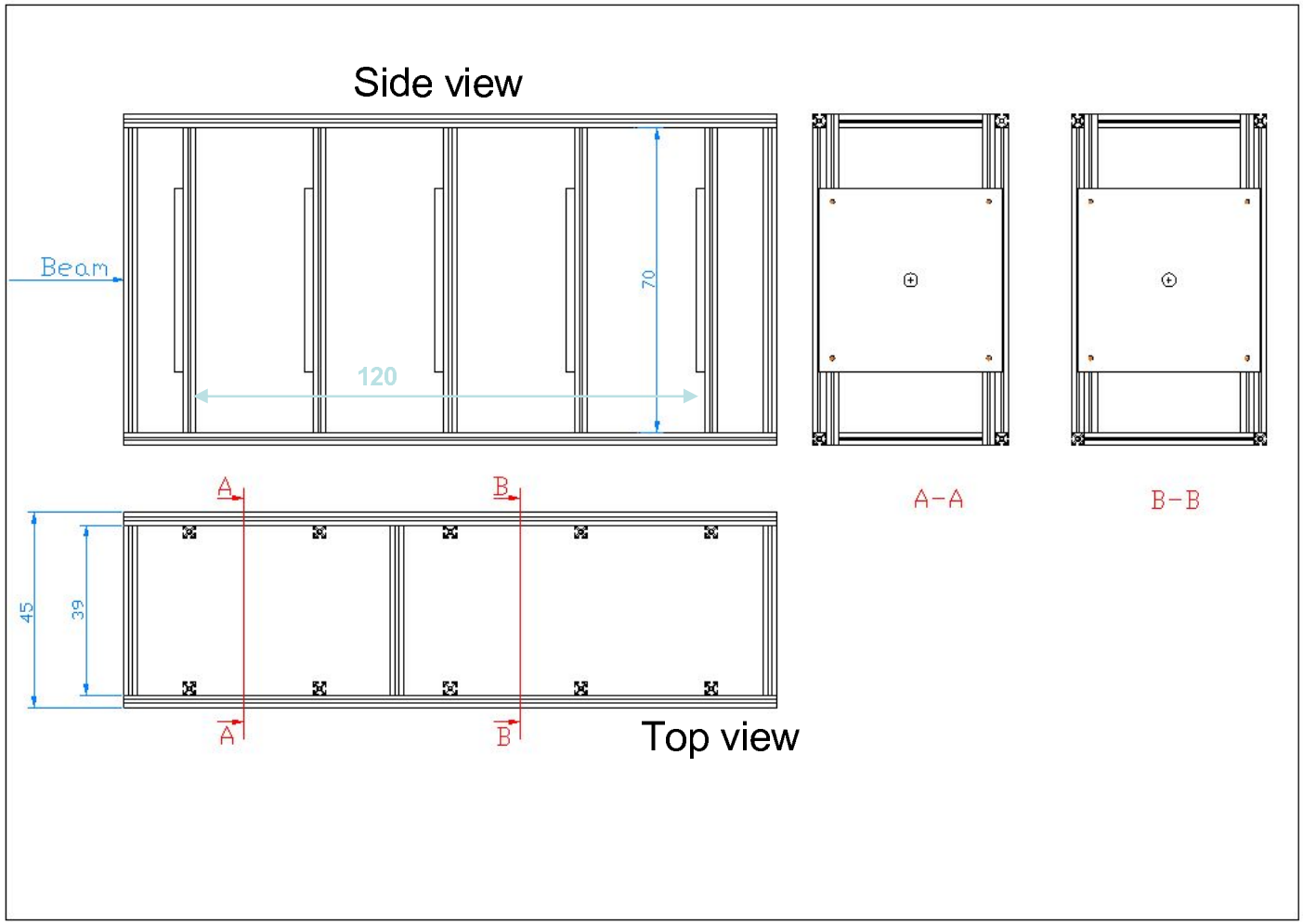
Goliath Dipole field measurements

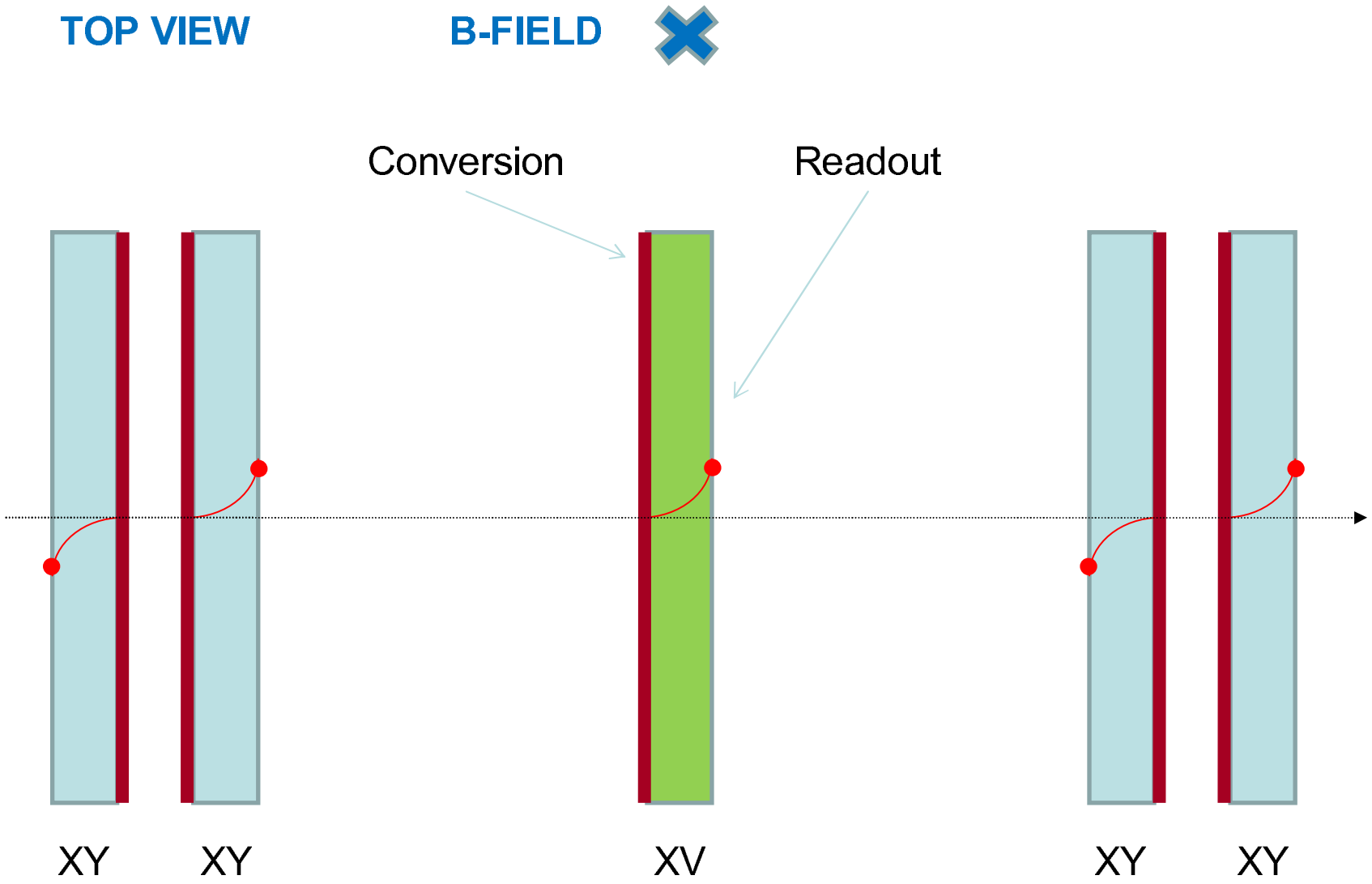






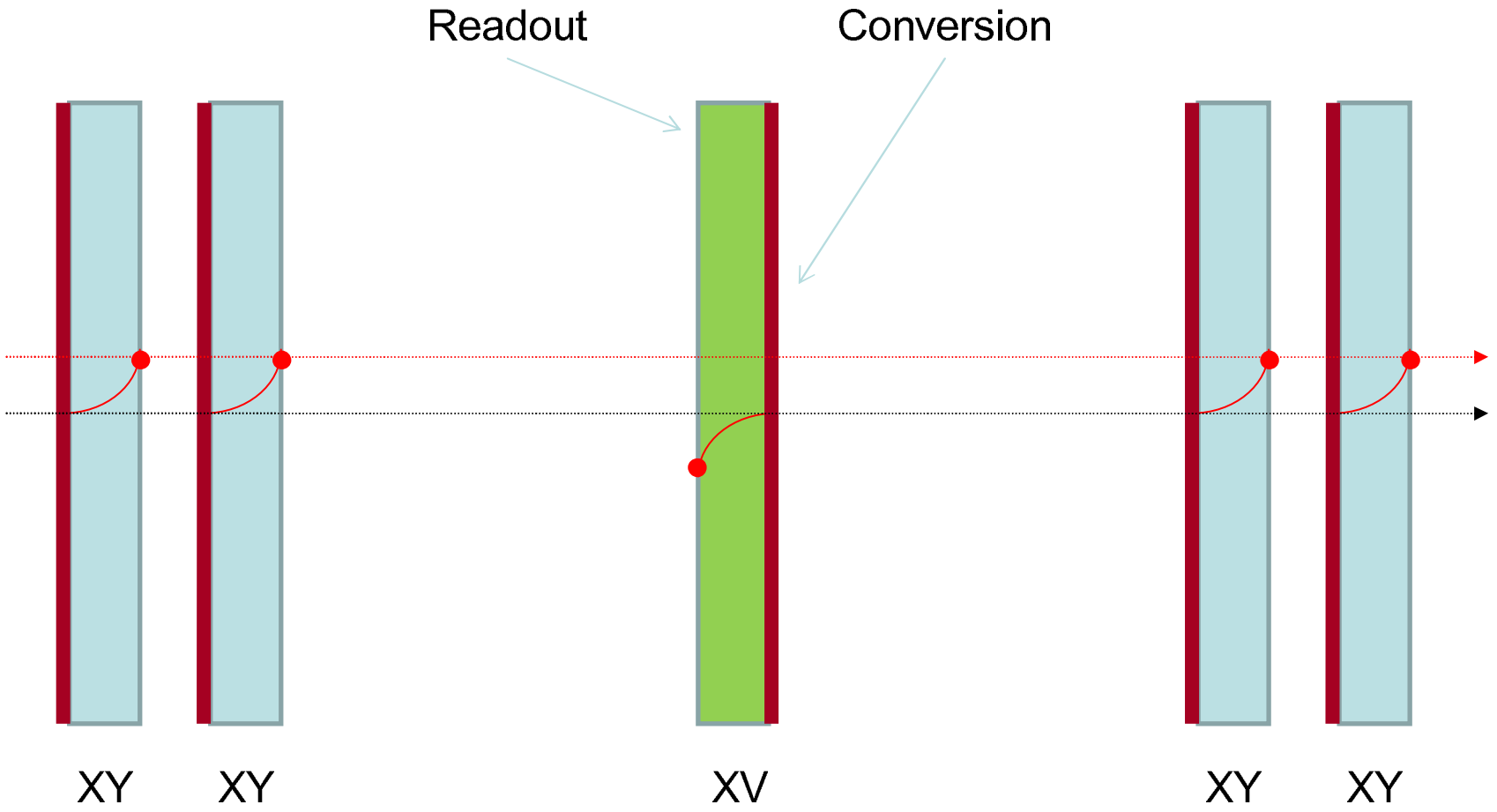
Support mechanics based on Bosch profiles





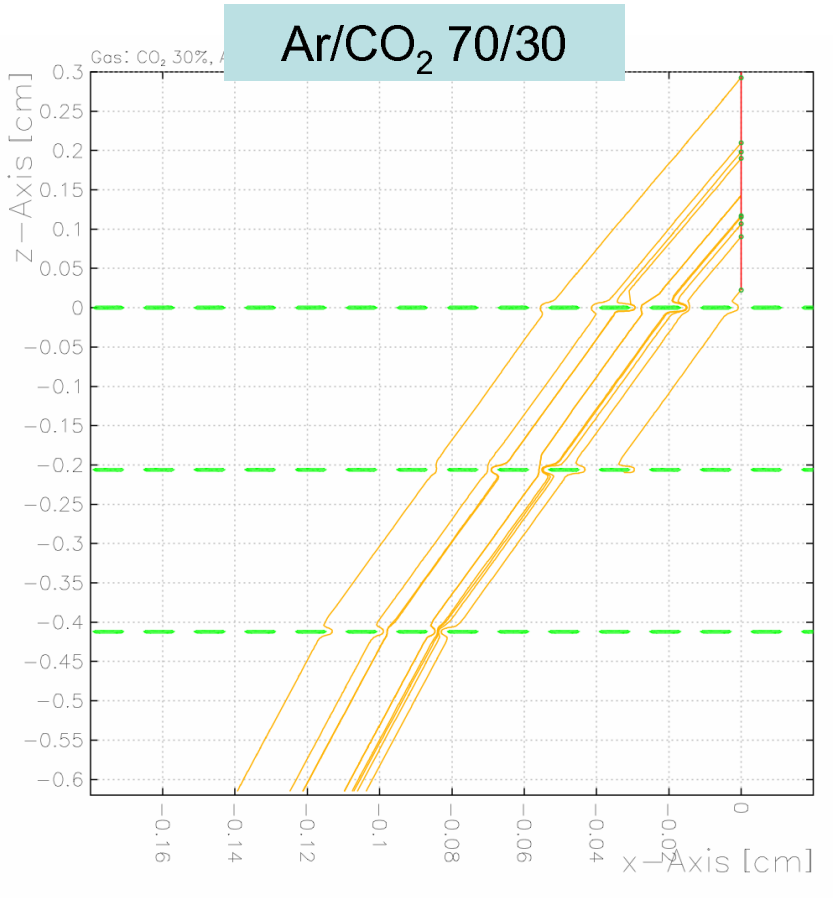
- 2 couples of XY to fit the track (2 points)
- Prompt measurement of the Lorentz angle

TOP VIEW **B-FIELD**

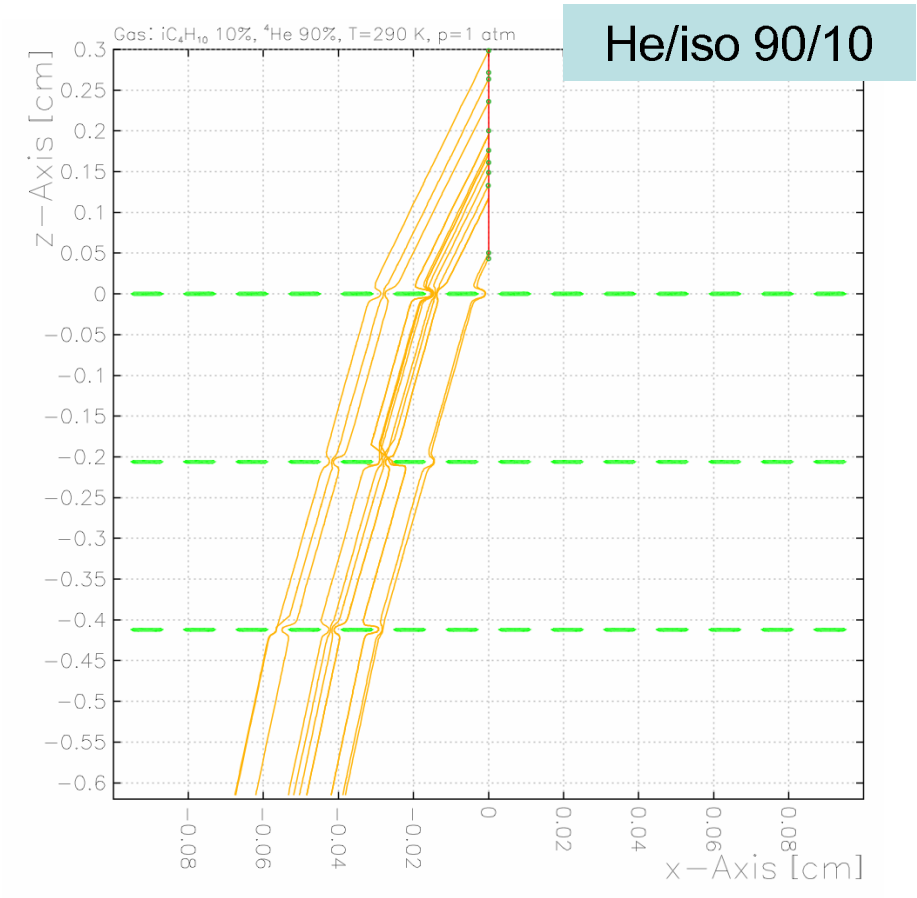


- 4 points for a better reconstruction of the track
- XV chamber fipped to measure twice the Lorentz angle

Effect of Magnetic field



average shift 1.2 mm



average shift 0.5 mm

Conclusions

- We are developing a new Cylindrical-GEM detector as Inner Tracker for the KLOE2 experiment
- A prototype has been already successfully tested in a testbeam, but without the final XV readout scheme
- Dedicated 10x10cm^2 Triple-GEM chambers have been assembled to study the XV readout in the RD51 June Testbeam
- The effects of the Magnetic Field will be another main item to measure