RD51-WG7 Report

RD51 collaboration week

CERN, November 2009

Matteo Alfonsi & Yorgos Tsipolitis

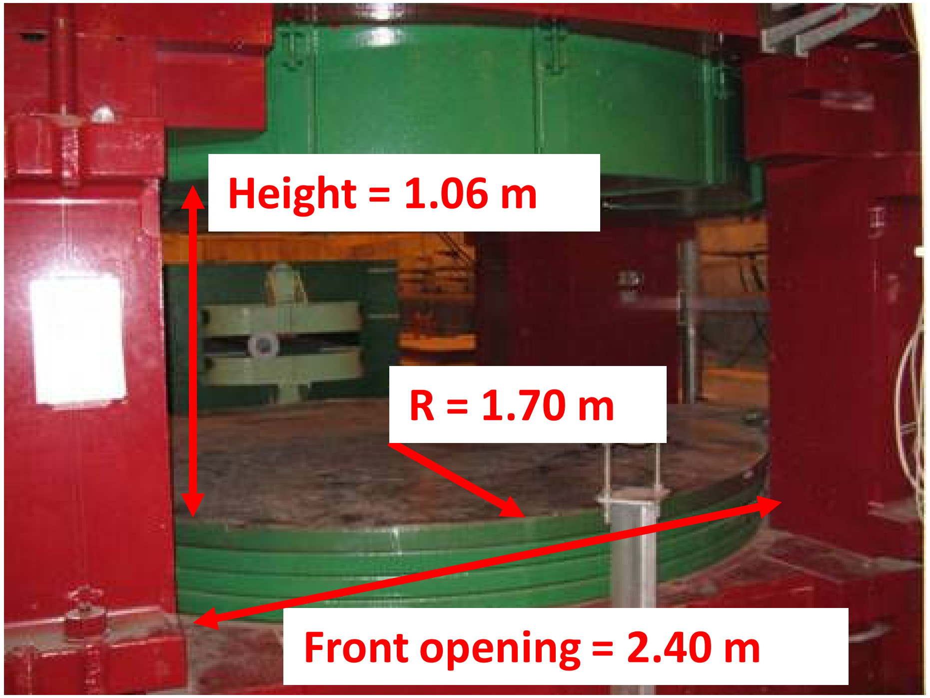
Outline

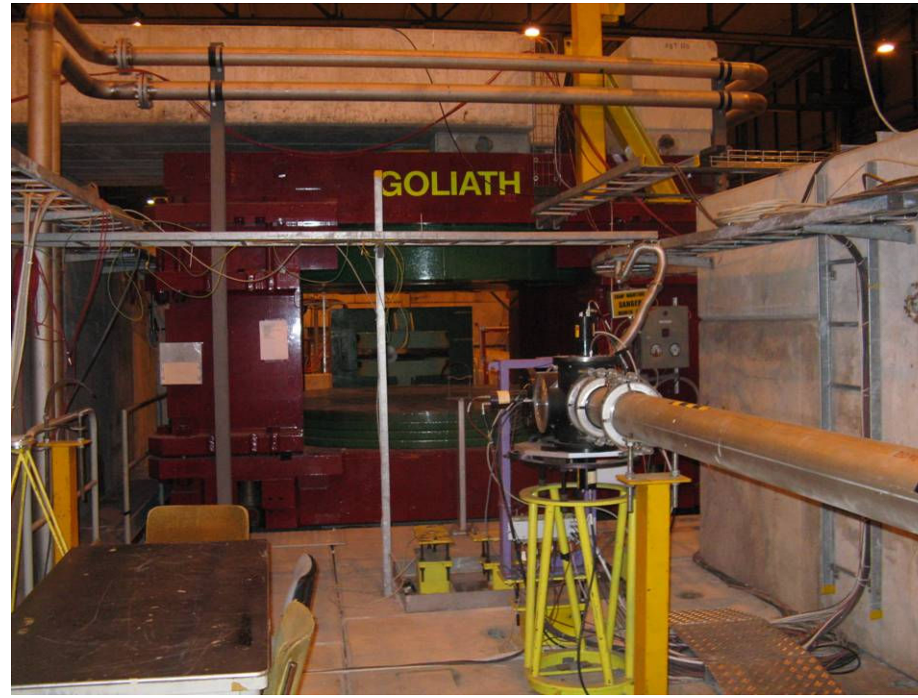
- Common Experimental Setup
  - Telescopes
  - Gas
  - HV
  - DAQ
- Results
- Next Year

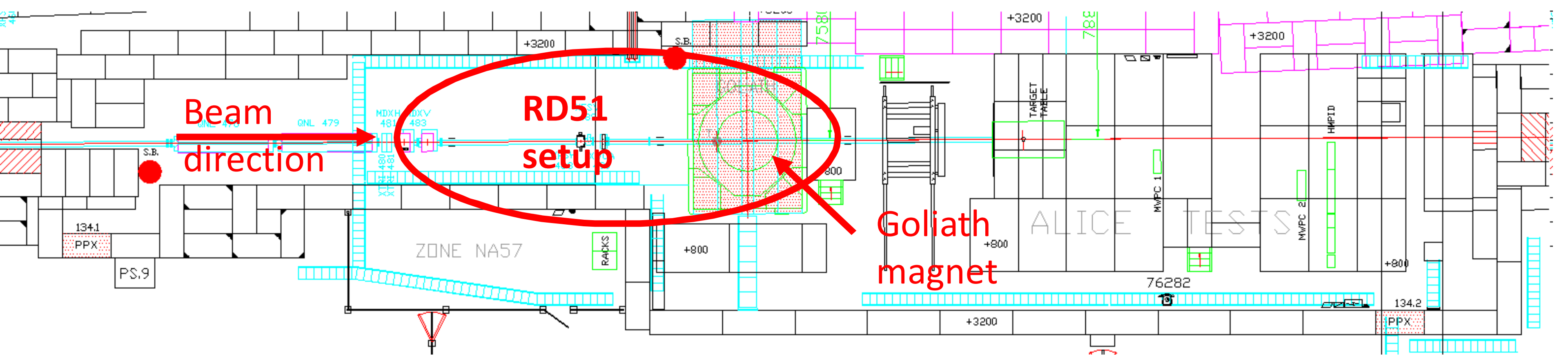
2009 TB requirements

- Dimension: around 60x60 cm^2 planar devices; weight: few kg devices
- *CF_4 and flammable gas mixtures*
- High resolution (better than 70μm) external tracker
- *Low or high rate beam, typically MIPS (pions preferred)*
- Mechanical Support allowing X-Y position and rotation
- *High Magnetic field, sometimes together with low energy beam*

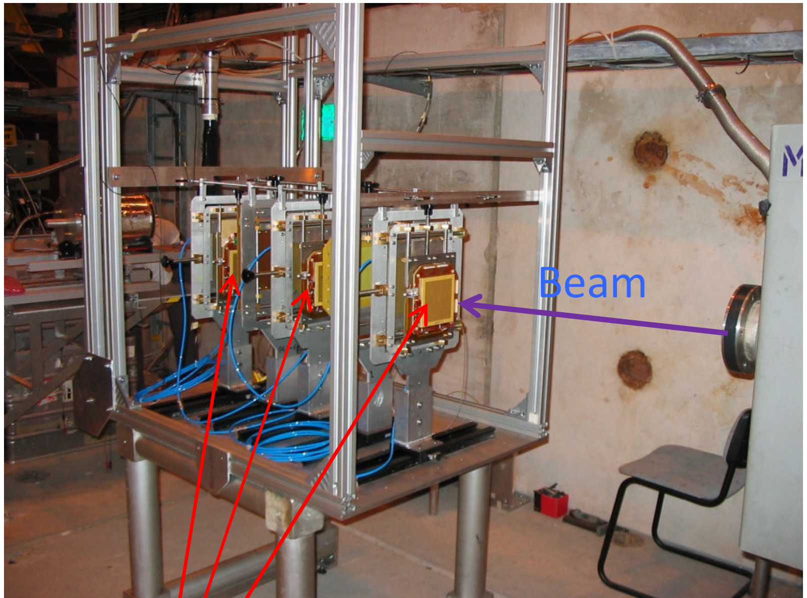
SPS/H4 line at Prevessin North Area

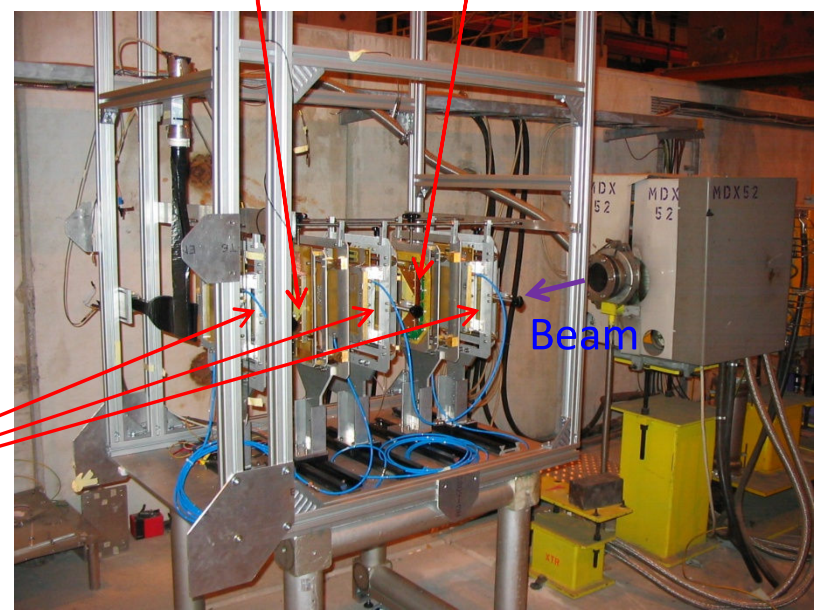






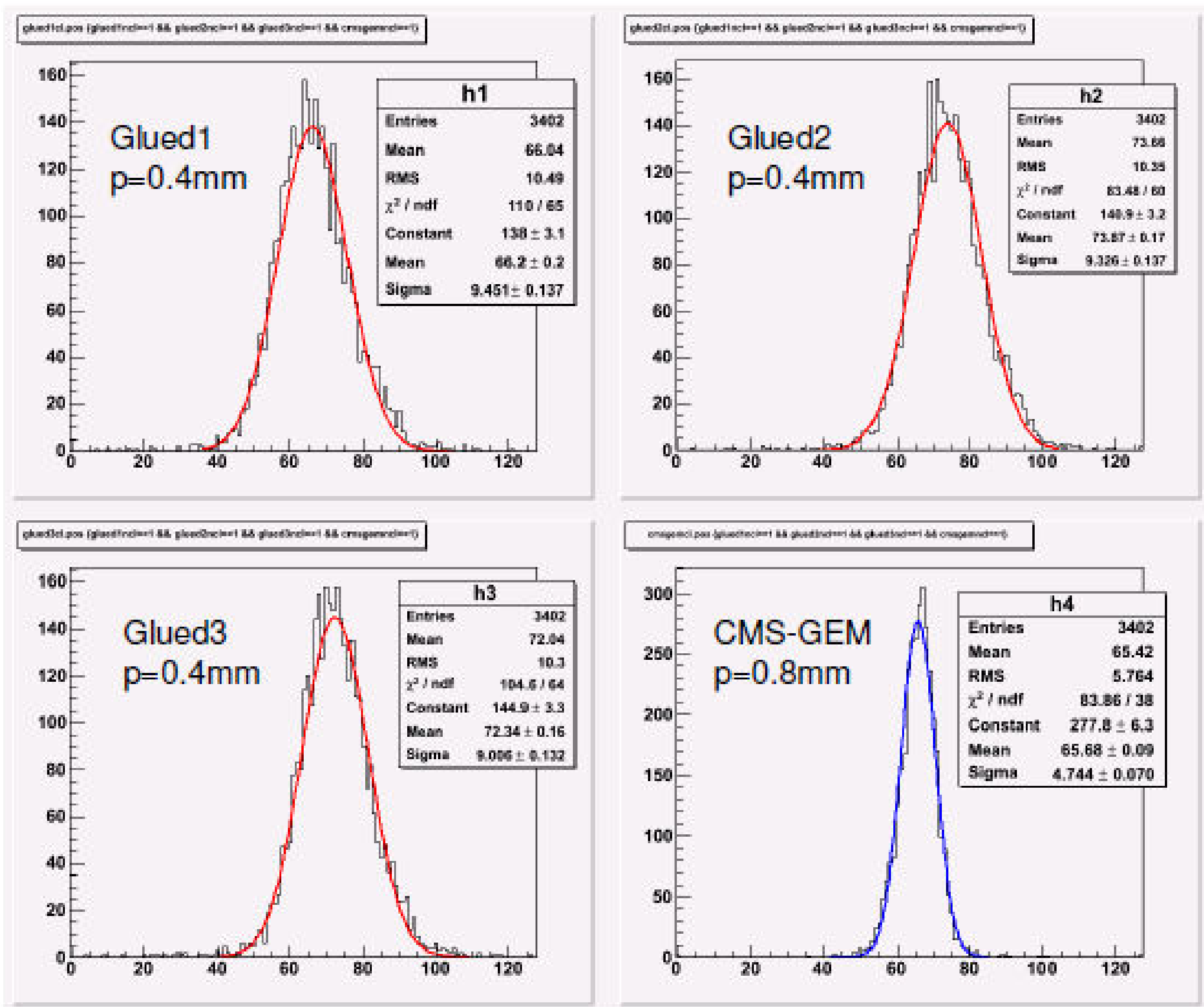
Experimental table with Trackers





Tracker commissioning

Beam Profile using Cluster positions

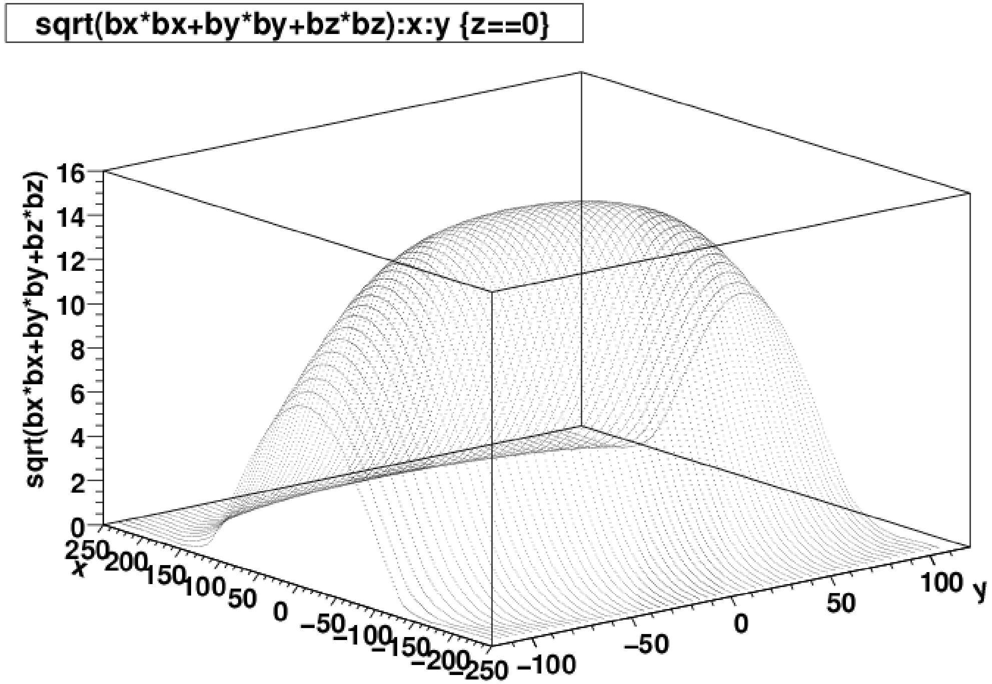


VFAT Channels

The Goliath Magnet

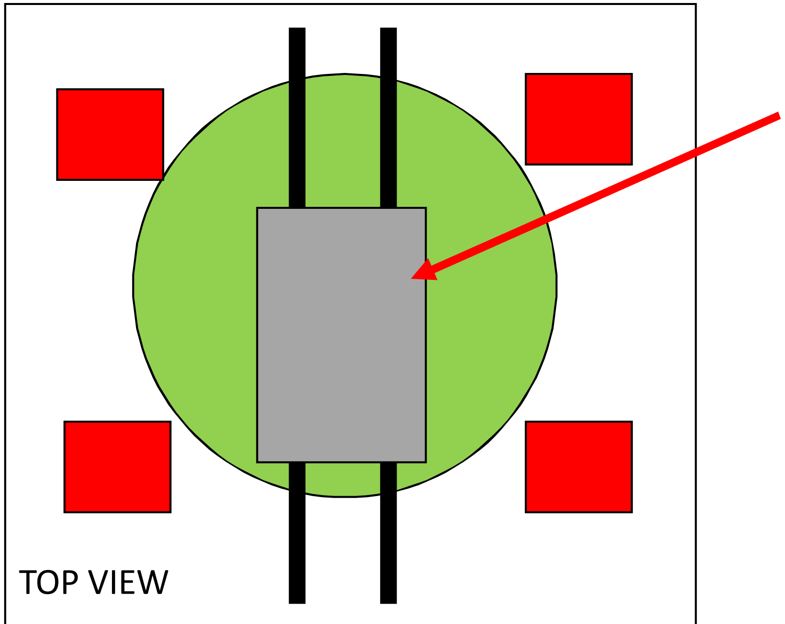
Power: about 2MW
Maximum field: 1.4T
Gap volume: around 8 m^3
Max. water pressure: 10 bar

- Looking at the map realized during NA57 experiment, the field seems to drop fast when approaching the border.



Field map realized during NA57 experiment, file decoded by Frascati group

Magnet mechanics

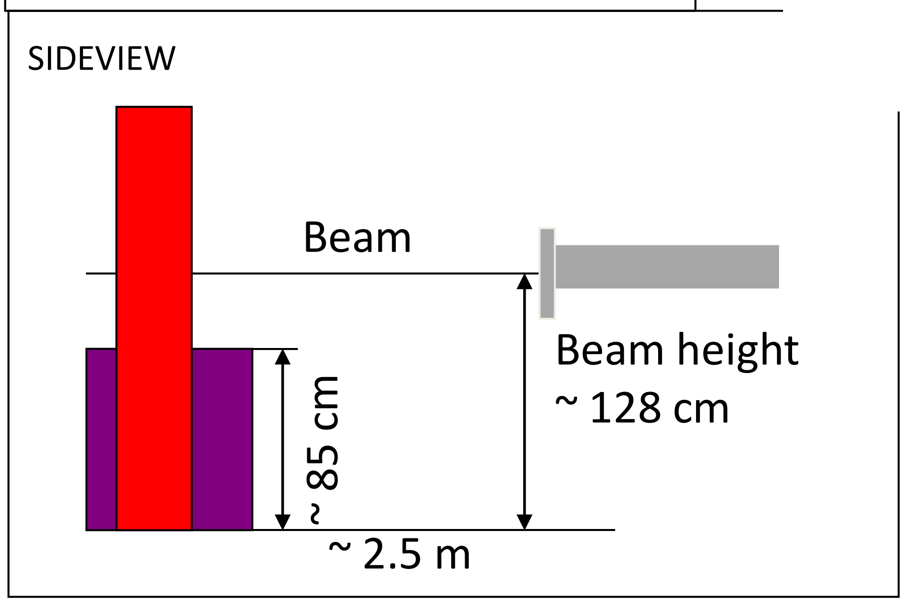


Similar table mounted over rails

Rails will extend out of the magnet for about 1m, with two legs for support

Table is moved out of the beam when not used.

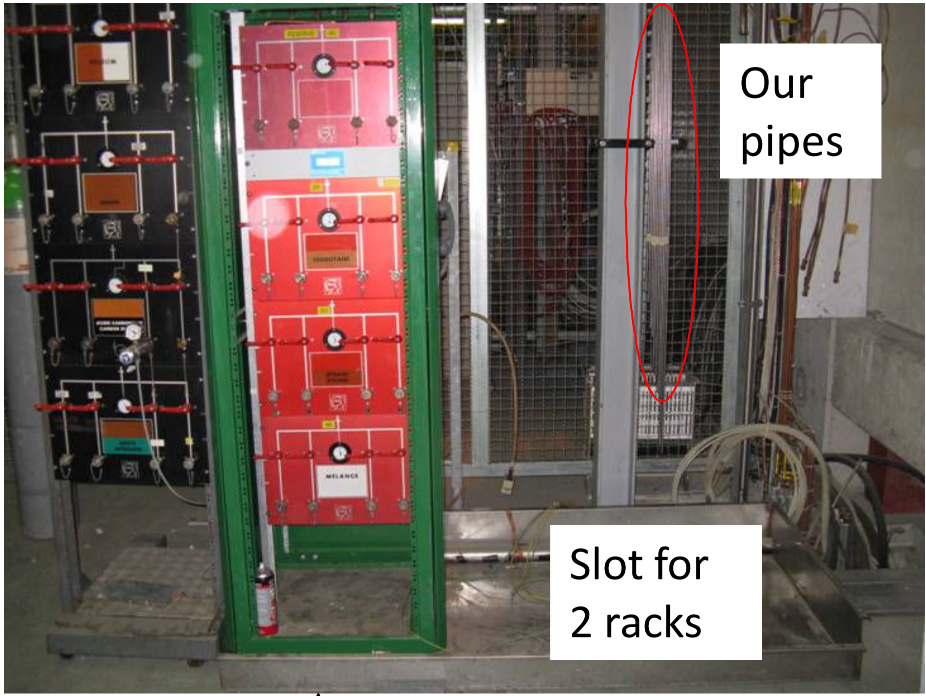
<u>More than 8m lenght for cable, to arrive from rack to the farthest part of the magnet, properly using cable trays</u>

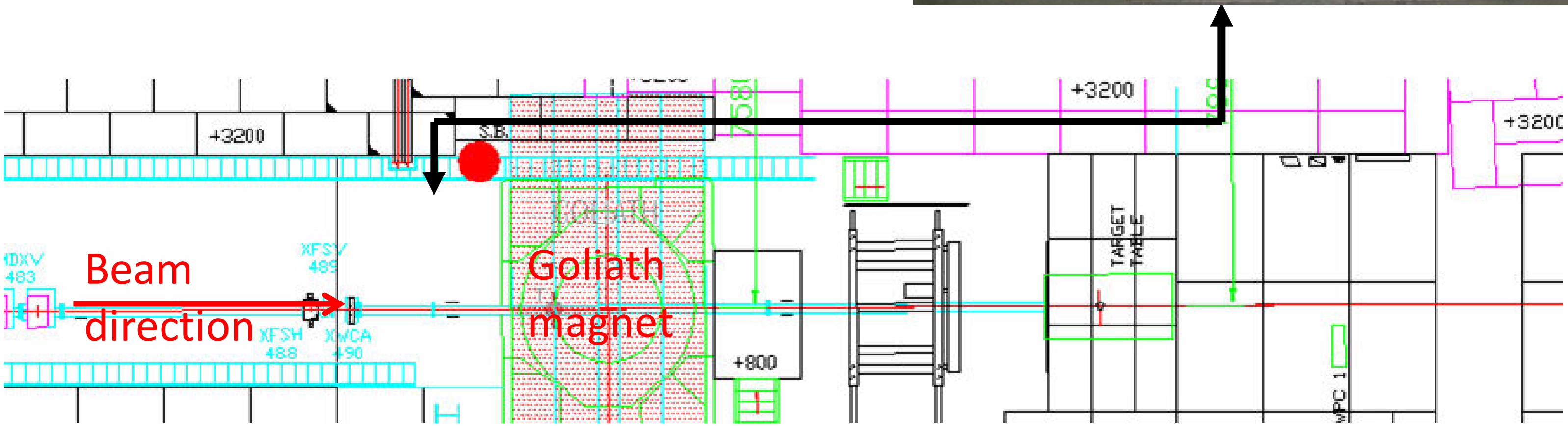


RAIL SYSTEM:

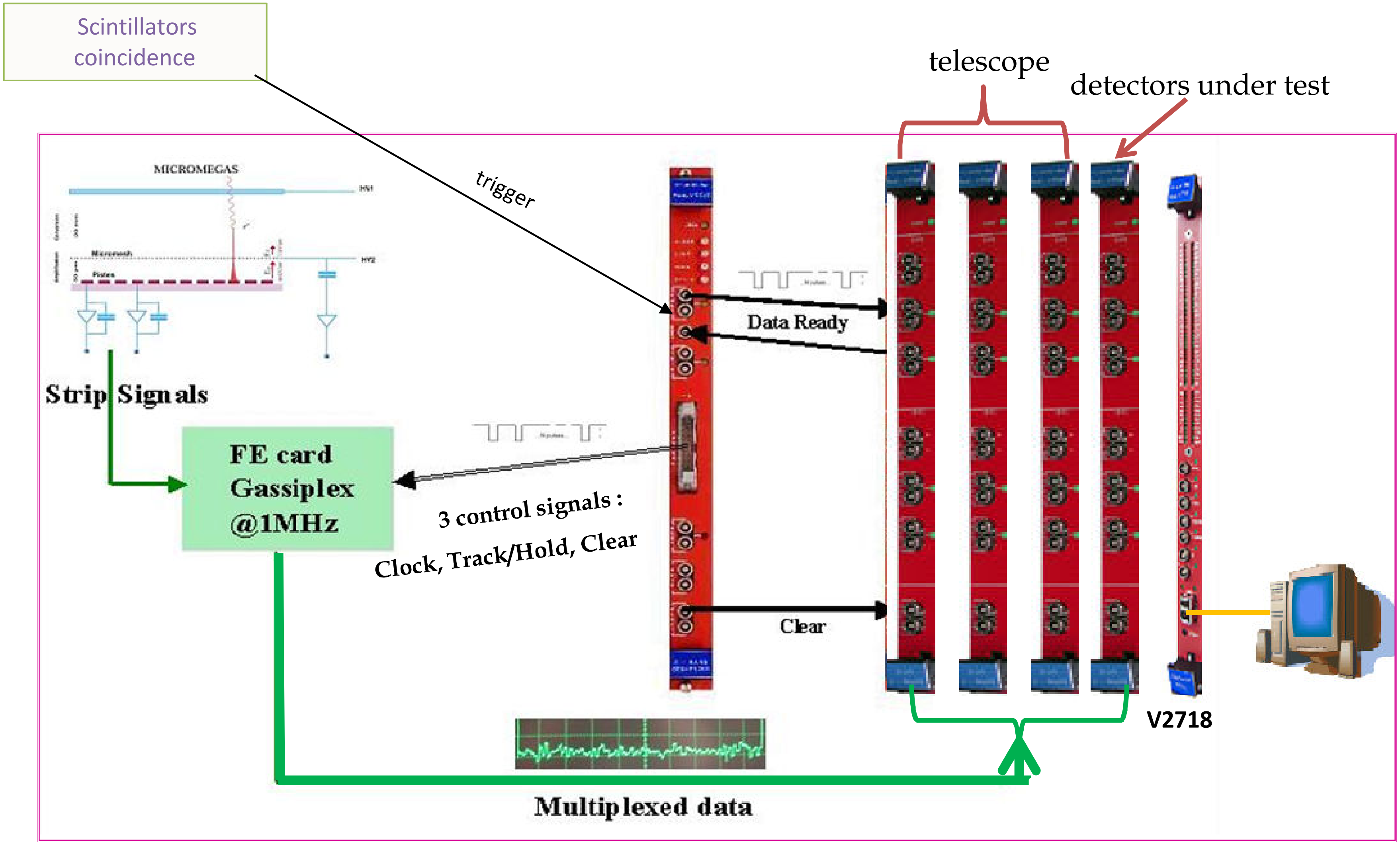
Provided gas infrastructure

- Stainless steel from gas zone to a patch panel in the experimental area
- 5 lines, each with 6mm diam. pipes for inlet and 10mm diam. pipes as exhaust
- A sixth copper line provided by the SPS people is downstream Goliath





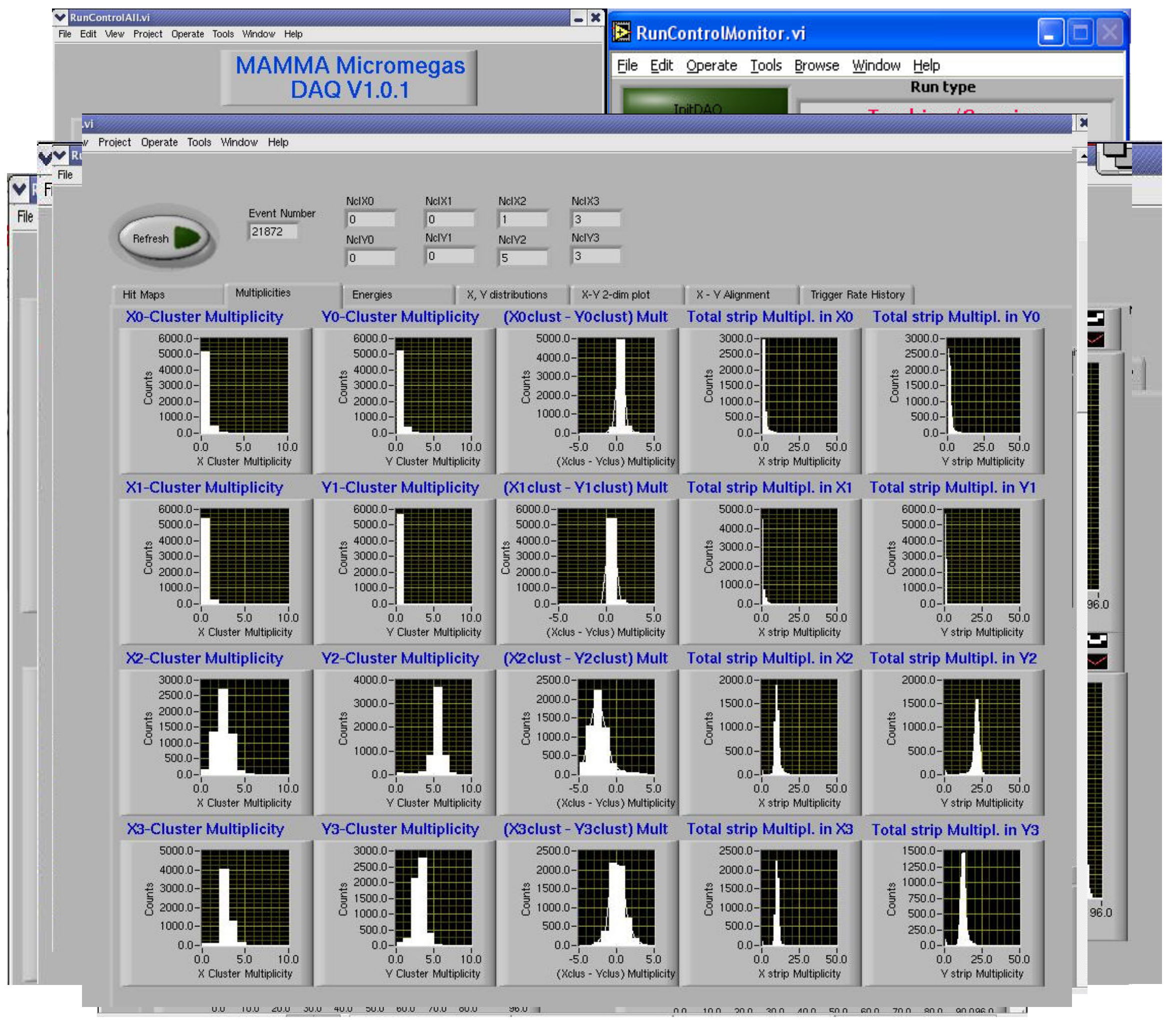
Data Acquisition system- Trigger logic



Data acquisition system- data monitoring

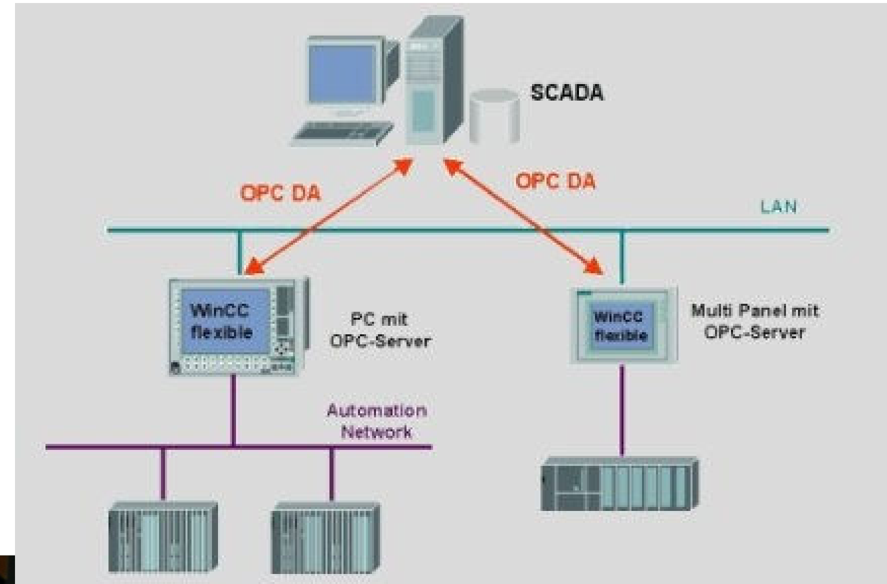
- The Data acquisition performs 3 tasks:
  - recording the events (from the strips),
  - displaying the events
  - online monitoring
    - Hit maps
    - Pedestal subtraction
      - Energies
      - X,Y distributions
      - XY 2 dimensions plot
      - Alignment
      - Trigger Rate History

✓ Maximum readout rate up to 120 events per second



Eleni Ntomari

SLOw Control SYstem



K. Karakostas

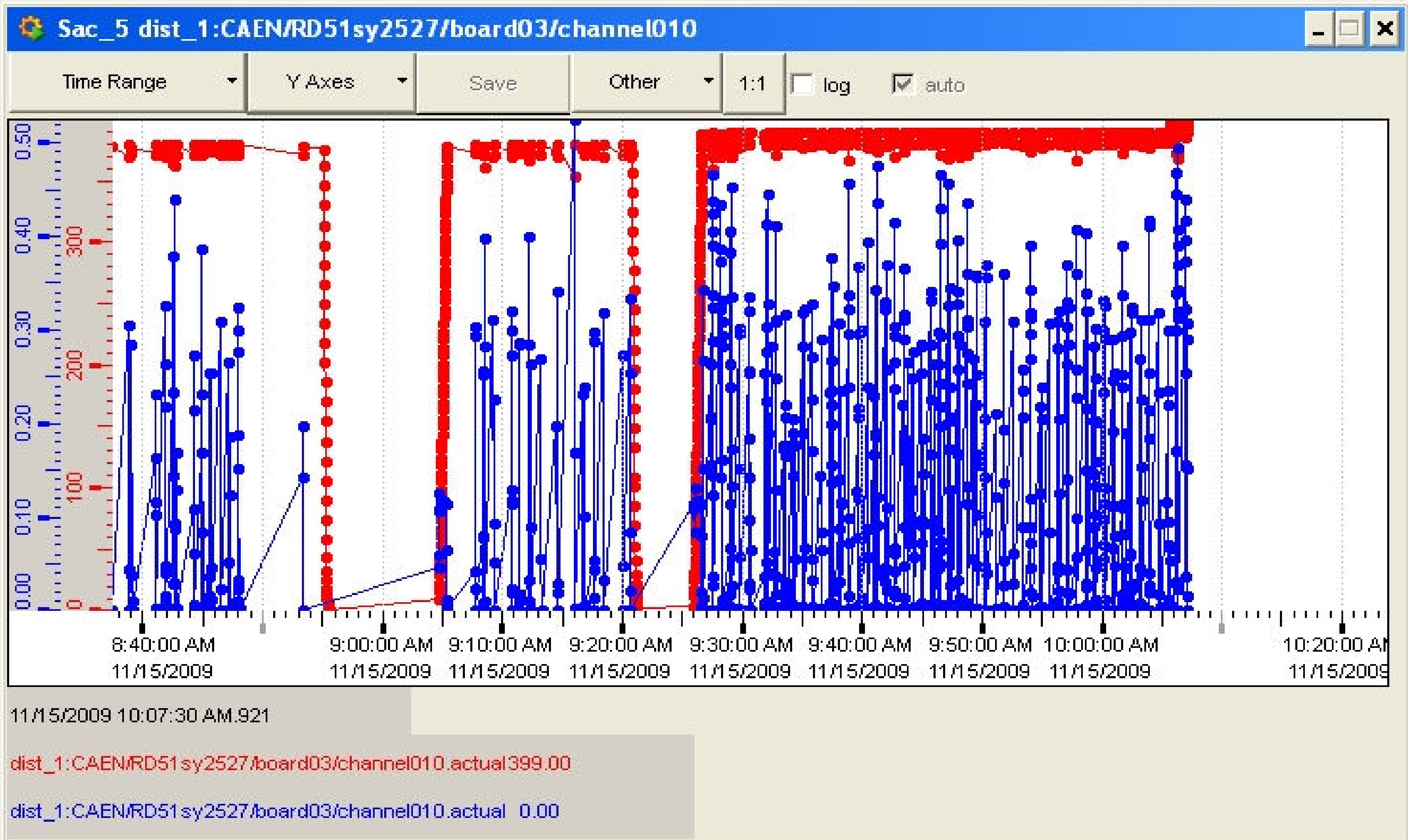
SLOw Control SYstem

Main Window

- ✓ Status of all
- ✓ vMon
- ✓ iMon
- ✓ Settings
- ✓ Initialization
- ✓ Export data

SLOw Control SYstem

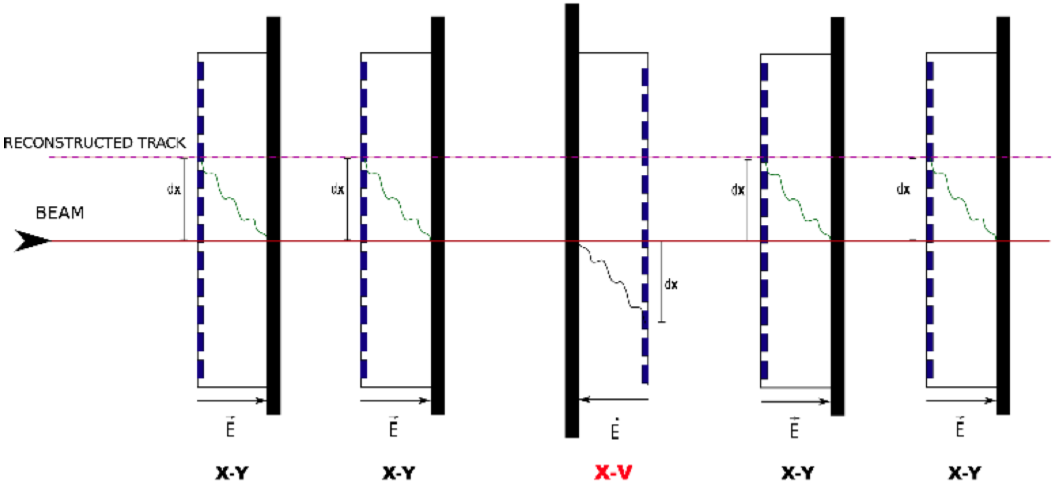
<u>Direct dual plot</u> with right-click on status of channel.



K. Karakostas

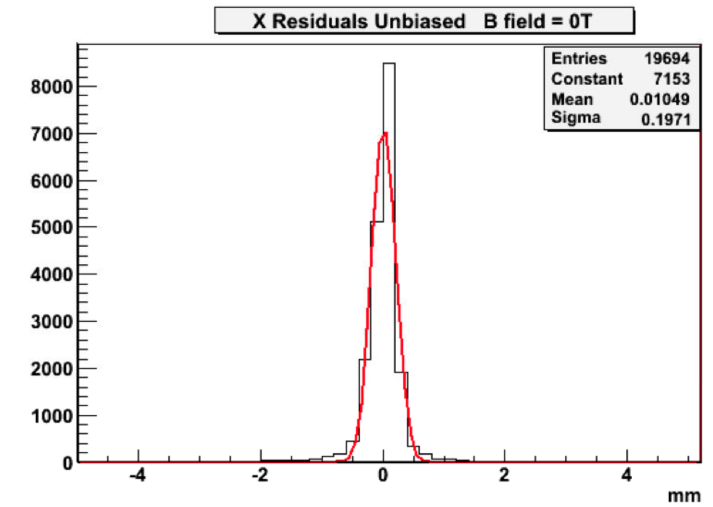
June test beam results

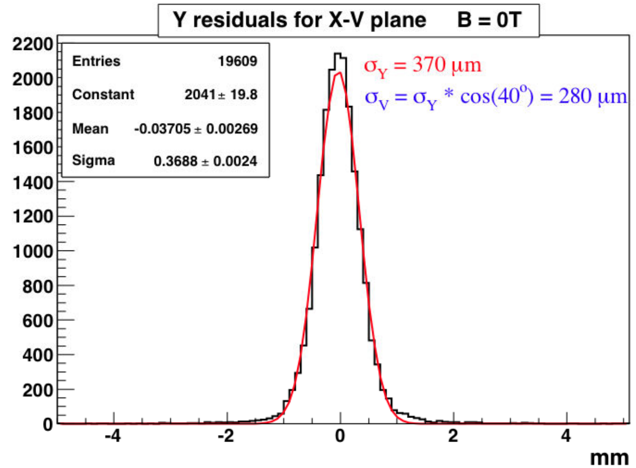
KLOE2 cylindrical GEM

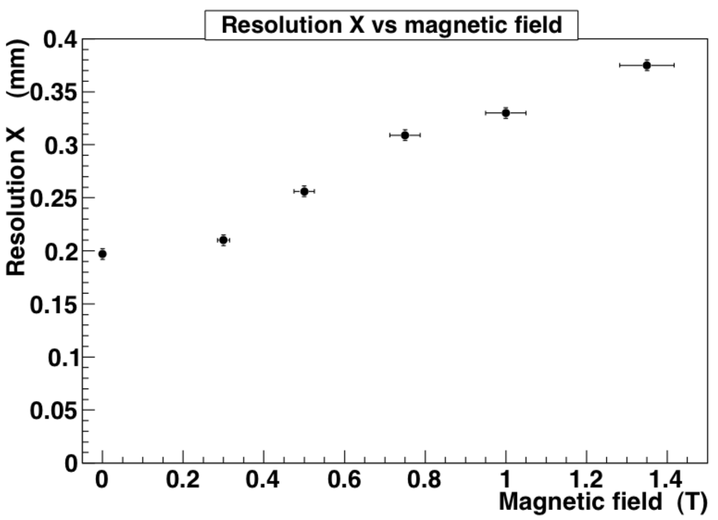


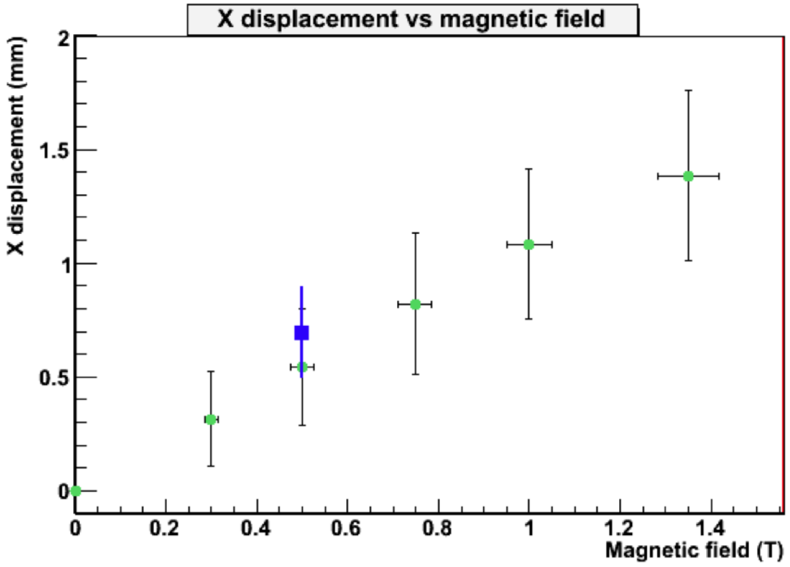
- The best readout layout (X-Y or X-V strips) for the KLOE2 Cylindrical GEM has been studied with a set of 10x10cm2 planar Triple-GEMs.
- The effect of the magnetic field on the performance (efficiency, spatial resolution..) has been studied

KLOE2 cylindrical GEM

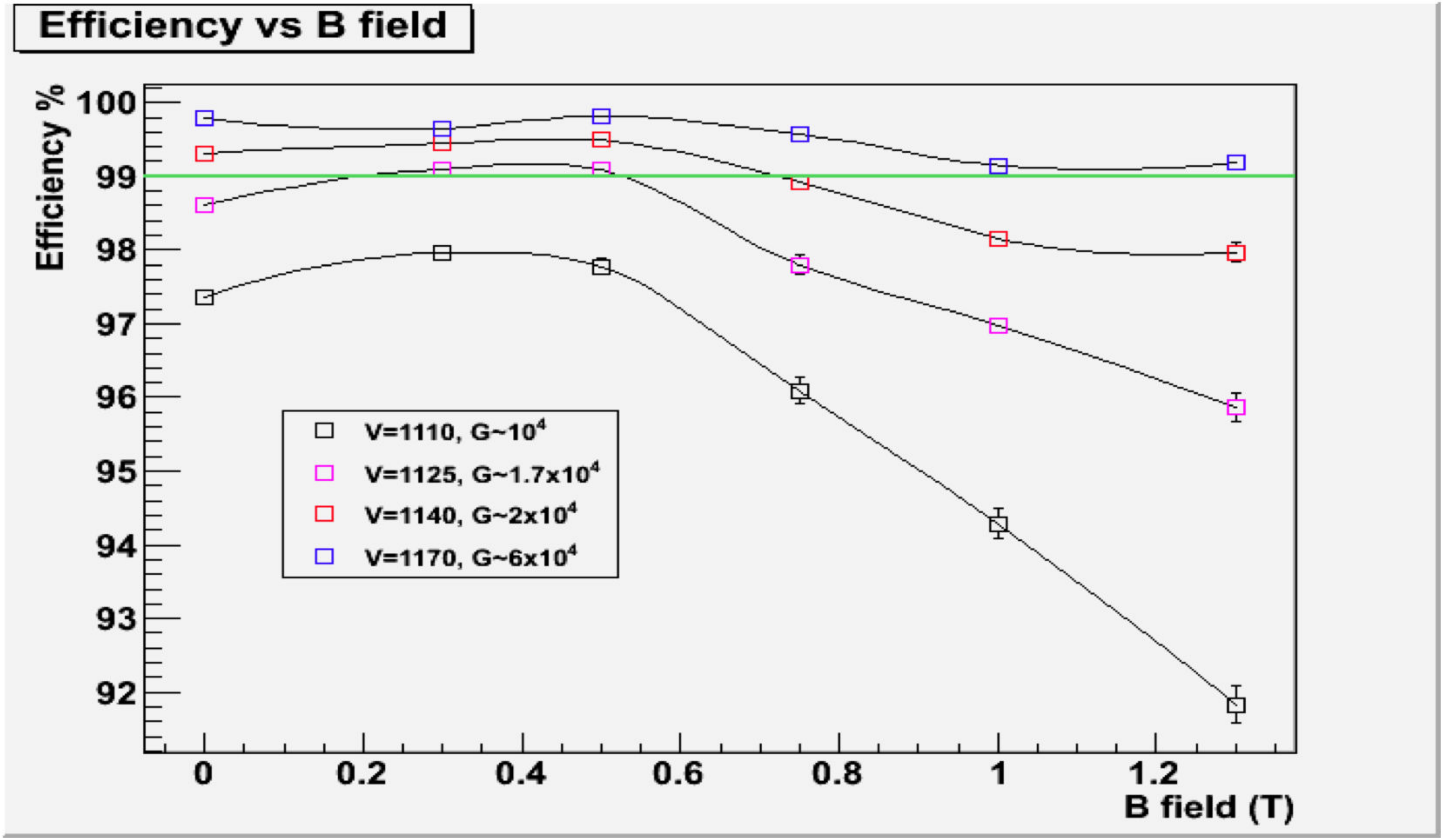








KLOE2 cylindrical GEM



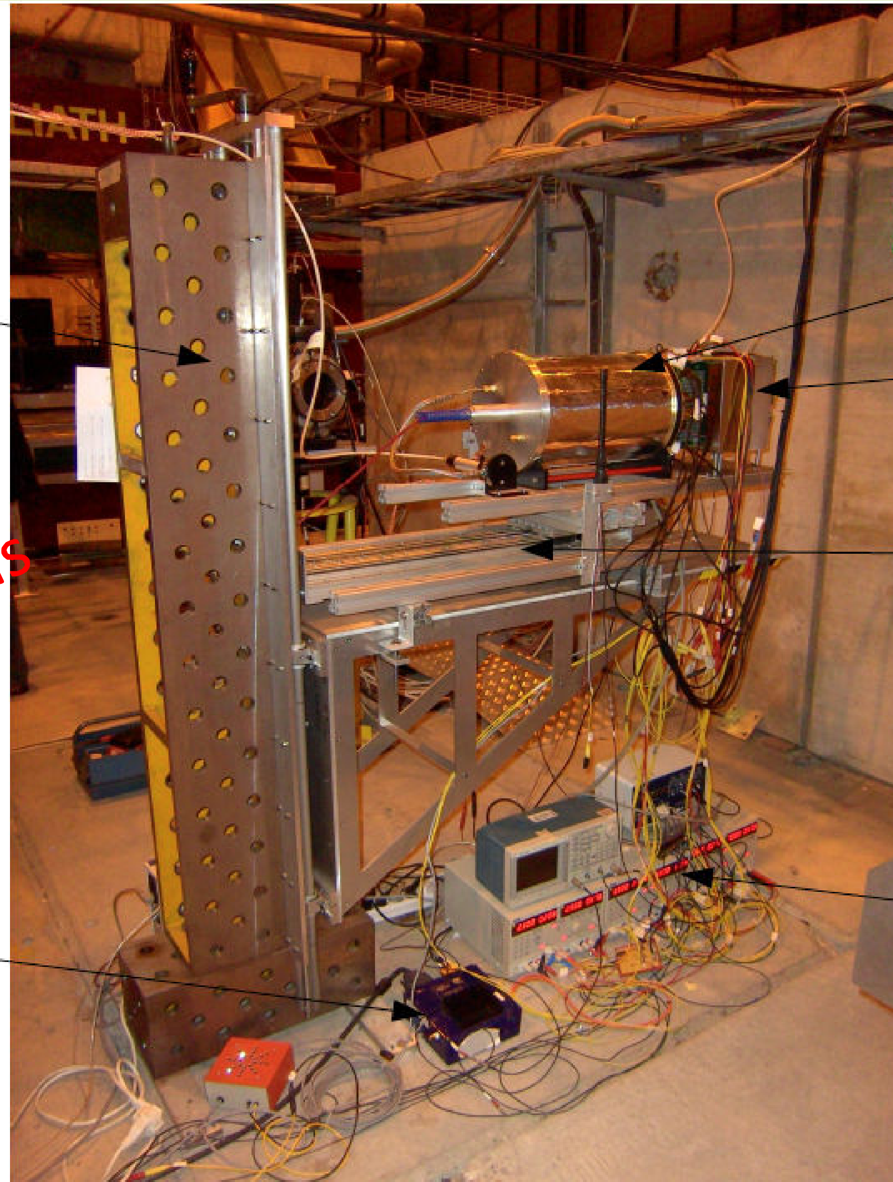
October test beam

Organization of the 5 groups

		lowest priority				main user
Mon 19th Oct						
		only control room stuff can be installed..				
Tue 20th Oct						
		only control room stuff can be installed..				
Wed 21st Oct						
		only co				
Thu 22nd Oct						
Morning 8 - 16		we can				
Evening 16 - 24	0	No "main user" shifts up to next morning - access regulated by "gentleman agreement". Magnet OFF, just one test after completing the installation				
	0					
Fri 23rd Oct						
Night 24 - 8						
Morning 8 - 16	0					
Evening 16 - 24	1A	MM TPC	RES MM	THGEM	CERN	Bonn
Sat 24th Oct						
Night 24 - 8	1B	Bonn	MM TPC	RES MM	THGEM	CERN
Morning 8 - 16	1C	CERN	Bonn	MM TPC	RES MM	THGEM
Evening 16 - 24	1D	THGEM	CERN	Bonn	MM TPC	RES MM
Sun 25th Oct						
Night 24 - 8	1E	RES MM	THGEM	CERN	Bonn	MM TPC
Morning 8 - 16	2A	MM TPC	RES MM	THGEM	CERN	Bonn
Evening 16 - 24	2B	Bonn	MM TPC	RES MM	THGEM	CERN

Main user & daily meetings to organize access & beam setting

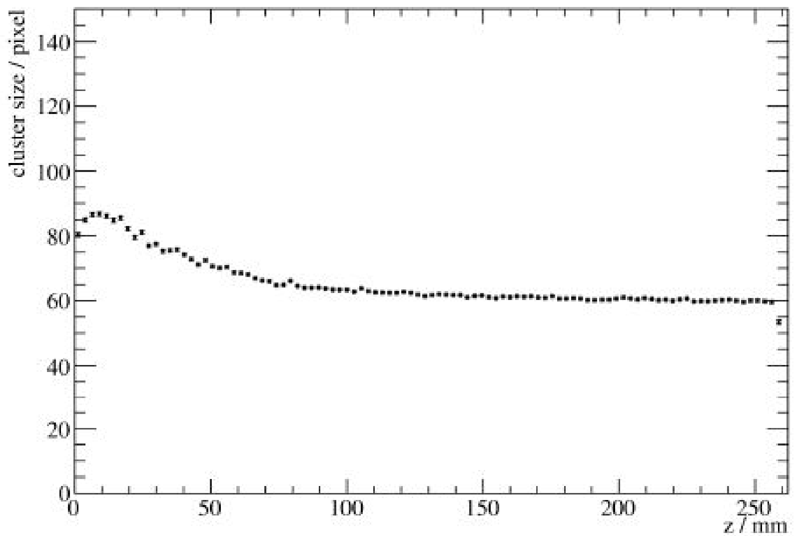
Bonn GEM TPC



On going analysis

universitätbonn

Goal 1 for Test Beam: Larger Pixel Sizes



Charge depositions are spread over ~60 pixels

=> pixel sizes are too small for the charge clouds generated by a triple GEM stack

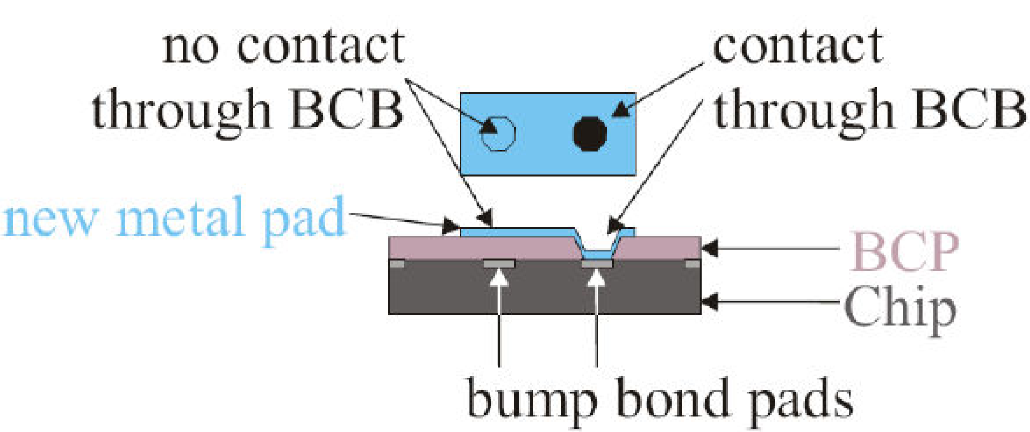
=> high gains (60,000 – 100,000) are necessary for the signal to pass over threshold of pixels

TEST CHIPS WITH LARGER PIXELS

expensive to design

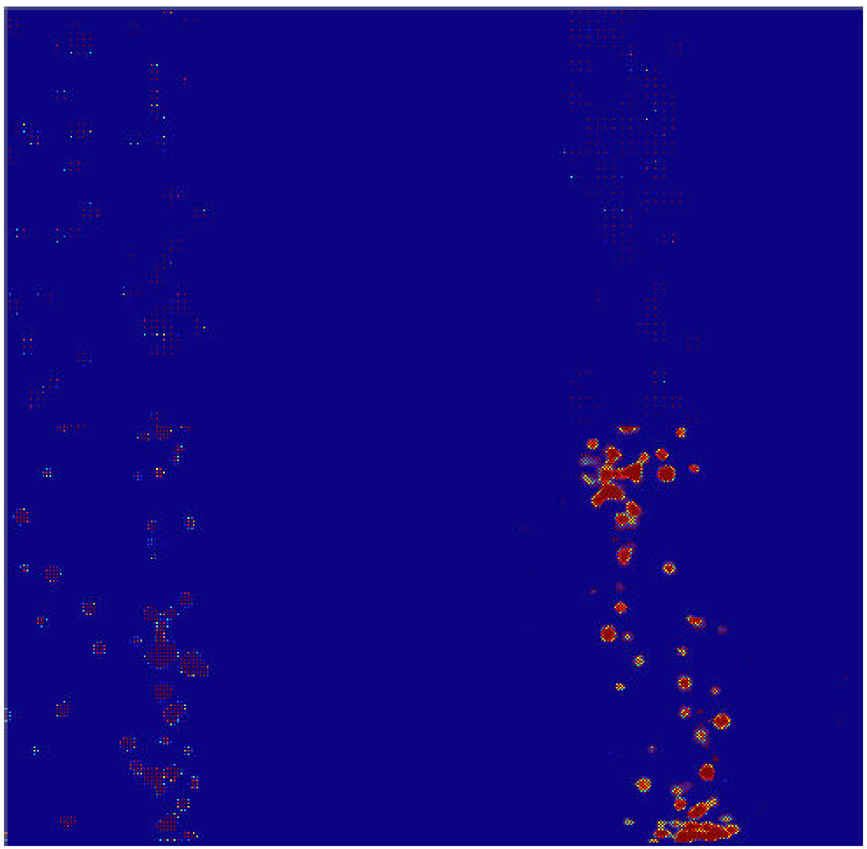
new chips

easier to combine pixels by adding new layers

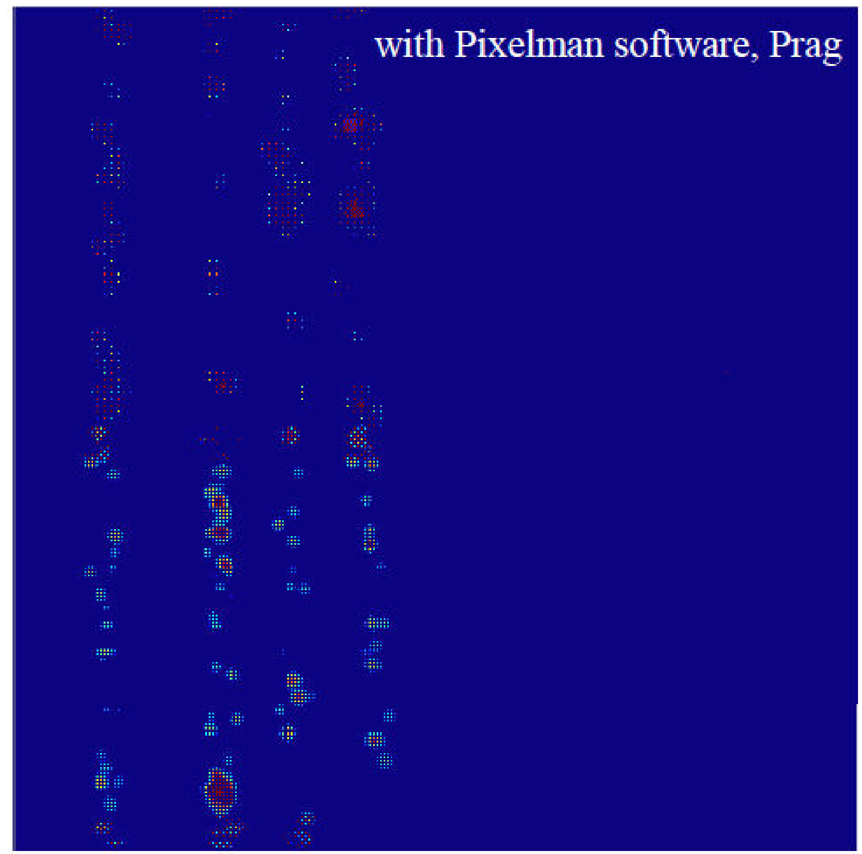


Some Pictures from the Online Display

- muons at 150 GeV
- drift distance: 25 cm
- 425 V across each GEM



- muons at 150 GeV
- drift distance: 5 cm
- 425 V across each GEM



Resistive µMegas for CLAS12 and COMPASS

Preliminary results

Resistive µMegas for CLAS12 and COMPASS

Goals of October beam test studies

- discharge rate reduction at high hadron flux (resistive layer, GEM foil)
- increase of cluster size for spatial resolution with larger strips (resistive layer)
- performances and discharge rates with large lateral magnetic field (small ionization gap with large electric field)

10 detectors to be tested

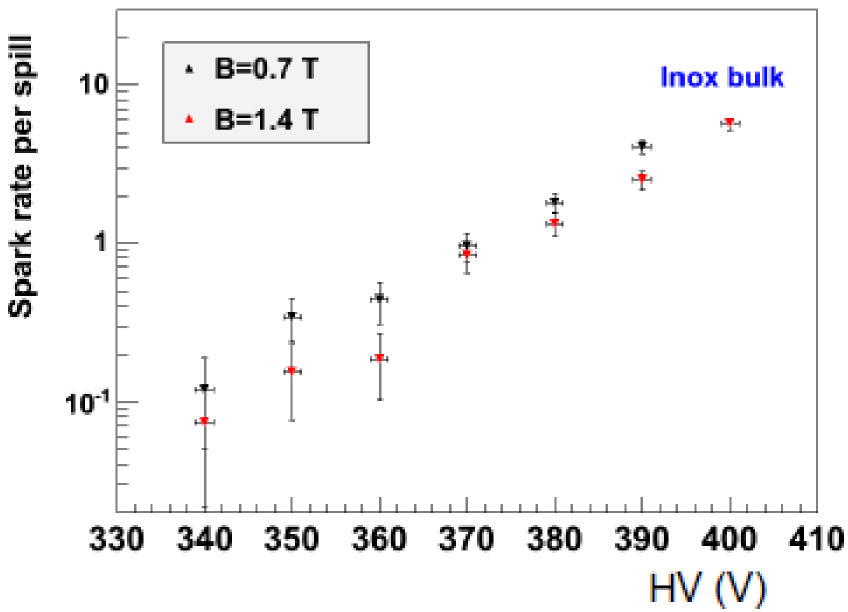
- 1 classic Micromegas with 5µm copper mesh
- 2 standard bulks as reference
- 1 bulk with 2mm drift gap + 1 bulk with inox drift electrode
- 1 bulk with an GEM foil
- 4 resistive bulks: 1 kapton foil, 1 paste on strips, 2 pastes over isolating layer (20 and 300 MOhm/^{2})

Resistive µMegas for CLAS12 and COMPASS

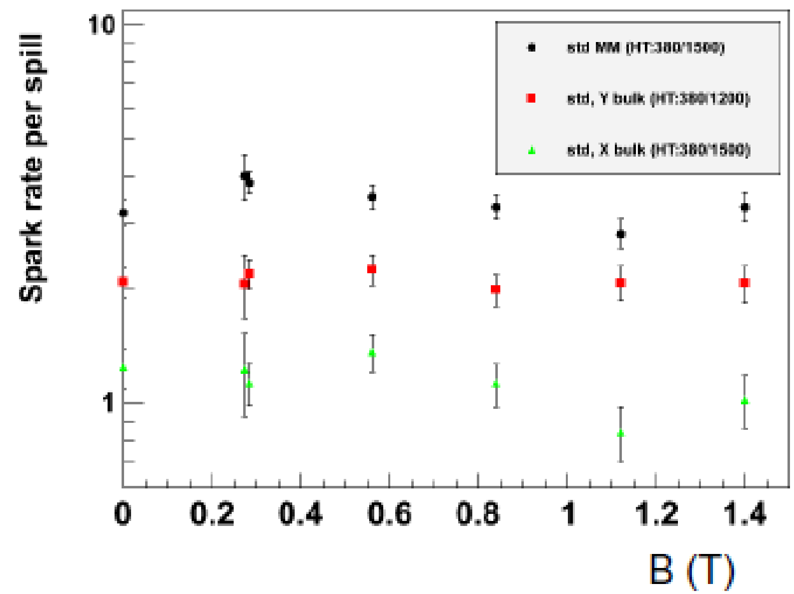
Preliminary results: discharge rates vs conditions

Hadron beam 150 GeV

Discharge rate vs mesh HV



Discharge rate vs B field



No strong effect of B field seen on discharge rate

Micromegas TPC panels at the RD51 beam test

Irfu cea saclay
Carleton U.

D. Attié, P. Colas, M. Dixit, Yun-Ha Shin, W. Wang, S. Wu

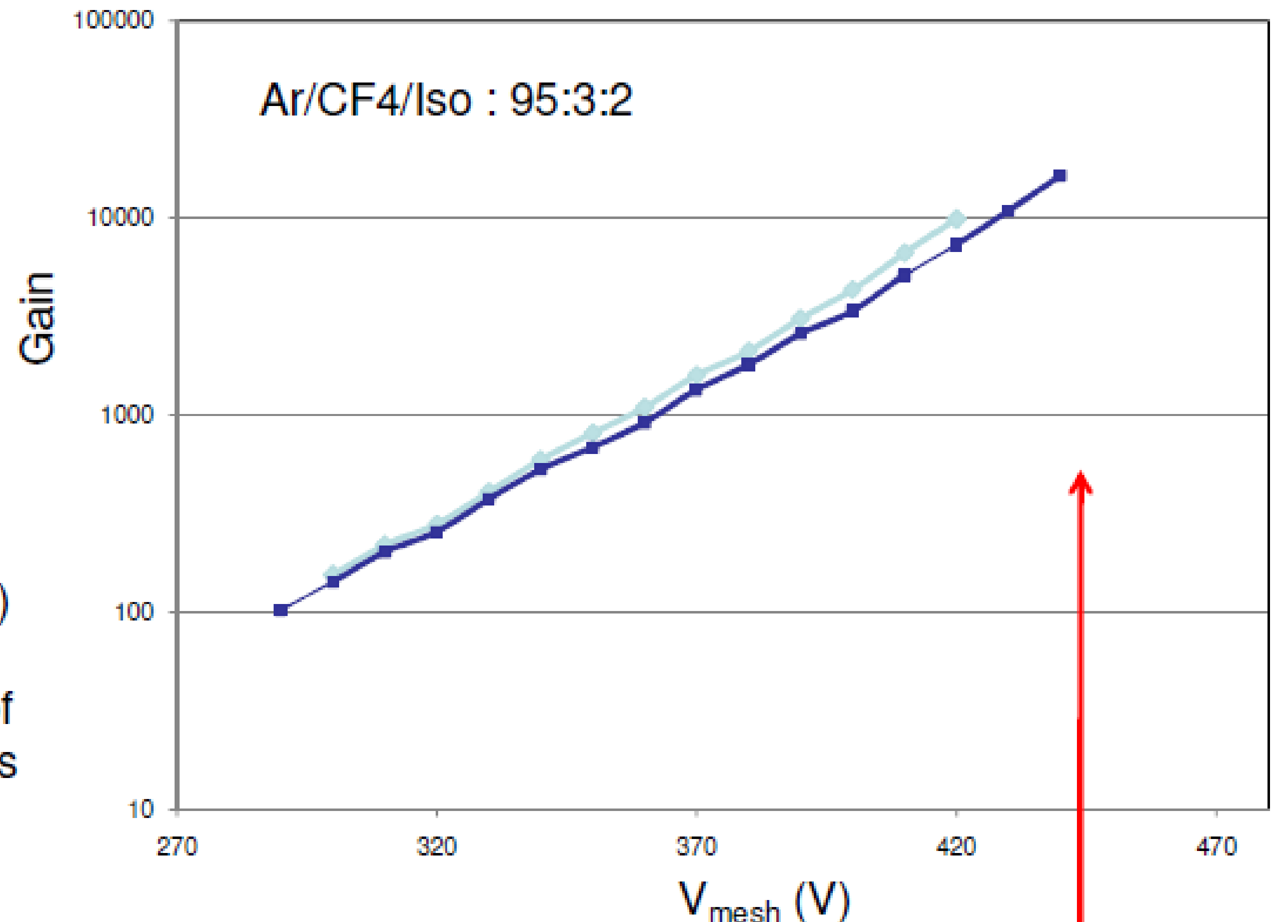
We installed our test box in the Goliath magnet with 1 resistive kapton Micromegas panel with 1726 T2K electronic channels.

We used premixed Ar+5%iso

The goal was to study the behaviour of the detector at high beam intensity with hadrons (60 to 100 kHz on 5 cm2)

Micromegas TPC

Gain curve measured from mesh current at 10^5 Hz (upper) and 2×10^4 Hz (lower) of pions



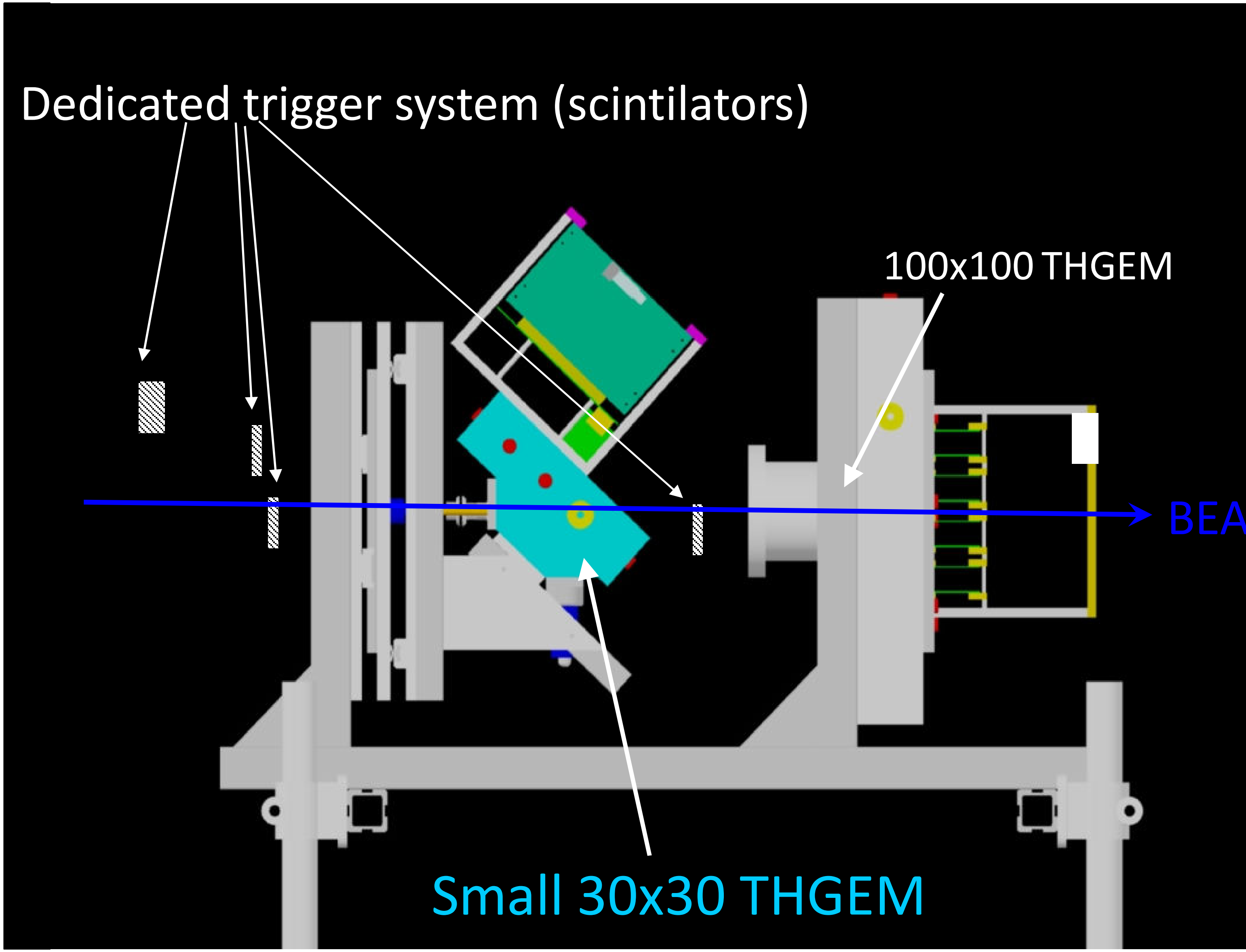
Primary ionization : 1800 e- per track (17 cm track length)

Measure currents of typically 10s to 100s of nA.

Consistent with measurements at low rate

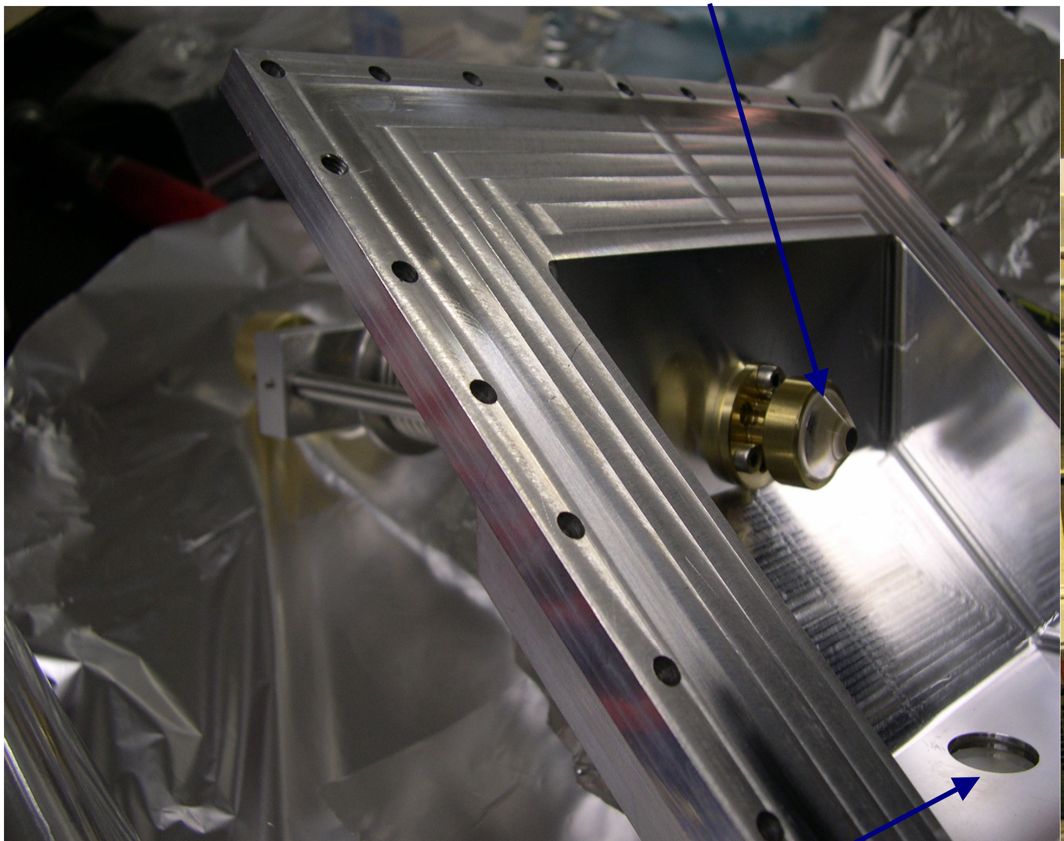
Hit current limit at 500 nA without breakdown

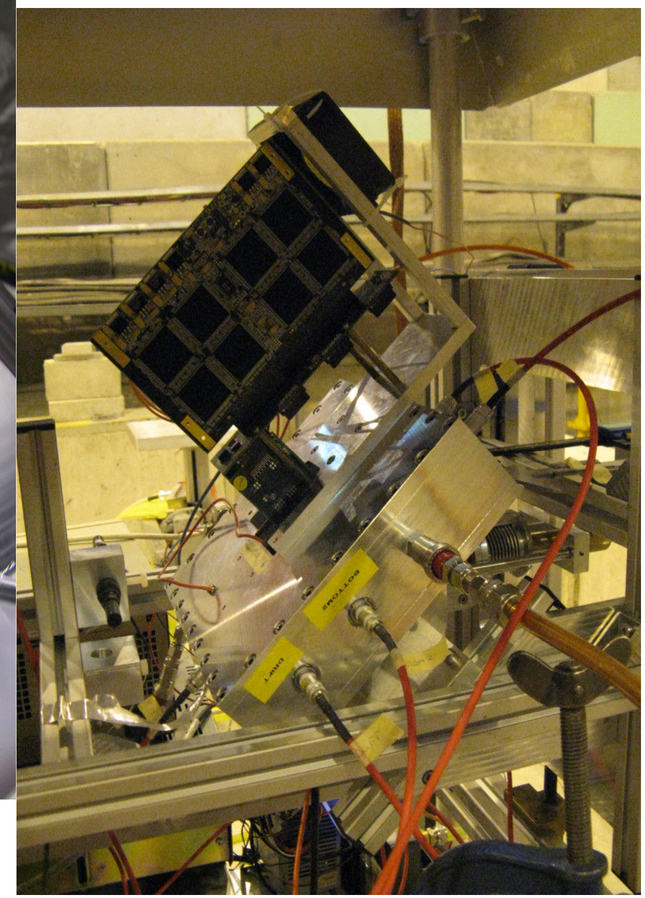
THGEM for COMPASS RICH upgrade



THGEM for COMPASS RICH upgrade

Quartz radiator





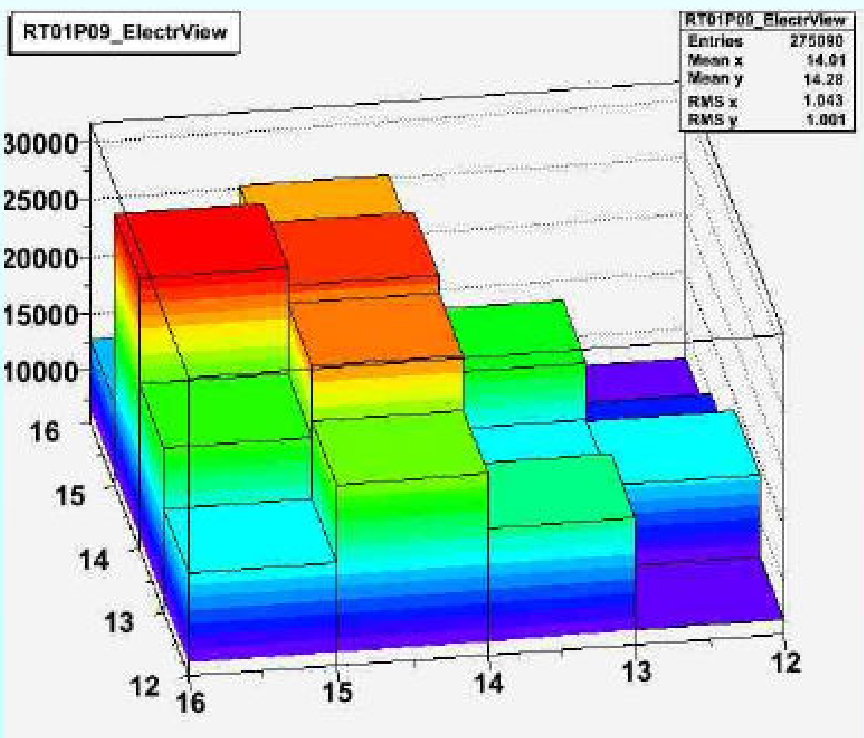
Window for LASER

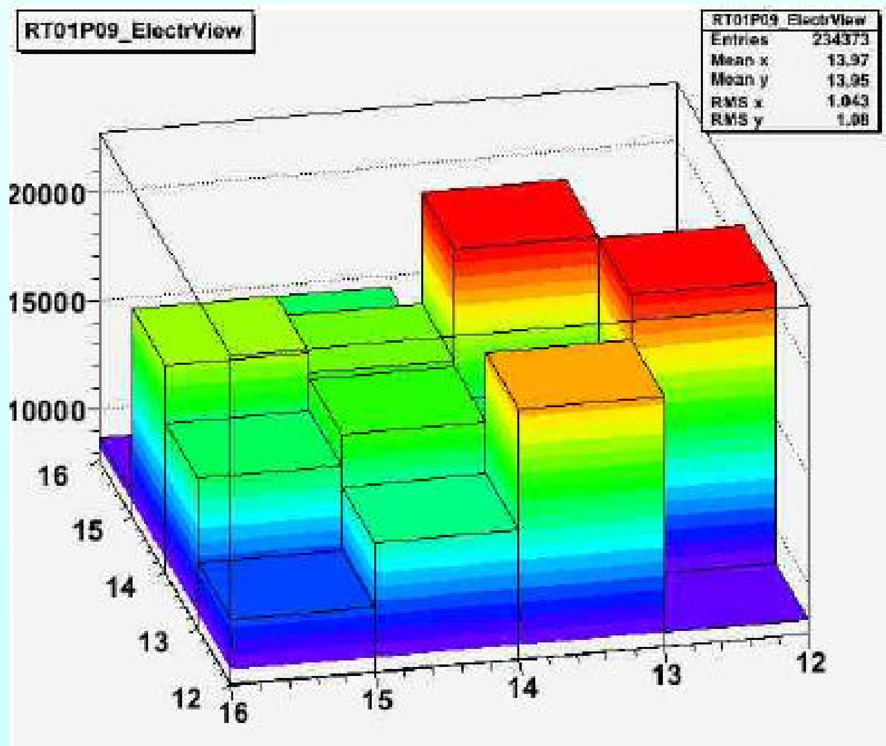
THGEM for COMPASS RICH upgrade

First indication of Cherenkov light

HIGH intensity beam
gain: ~ 4.10^4

2 different positions of radiator (change of 20mm)





Test Beam for 2010

- Please send requests for 2010 TB before the end of November. It has to be sent to the SPS coordinator by 12 December.
- We plan to group all the requests in three periods (e.g. June, September, November), with 3-4 groups maximum per period
- If you are not sure, still send the request!
- Please specify all the details, especially the excluded periods!
- We will send again the form to be filled tomorrow on the mailing list RD51-ALL

WG7 organization for 2010

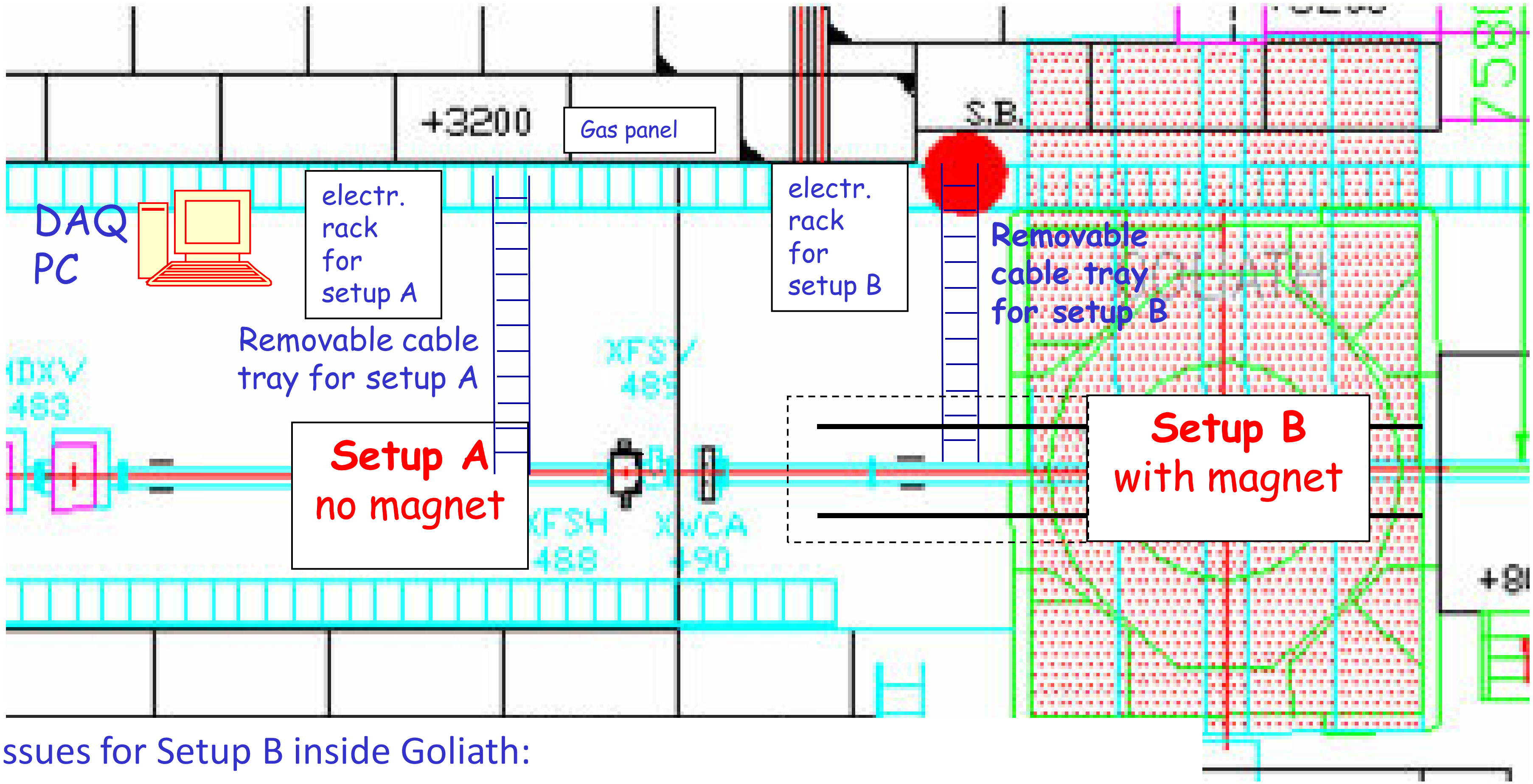
- Please be sure that you are subscribed in the RD51-ALL mailing list (we will send there important communications!)

- A specific WG7 mailing list has been created for communications internal to WG7, such as next year test beams organization.
  Please subscribe (accessing the CERN e-groups service - use your CERN NICE/AFS/other authentication) to RD51-WG7 mailing list:
  https://e-groups.cern.ch/e-groups/Egroup.do?egroupName=RD51-WG7

- WG7 has regular meetings every 2-3 weeks (weekly close to beam period) for test beam organization and common funds for infrastructure

Backup

The RD51 installation @ SPS/H4

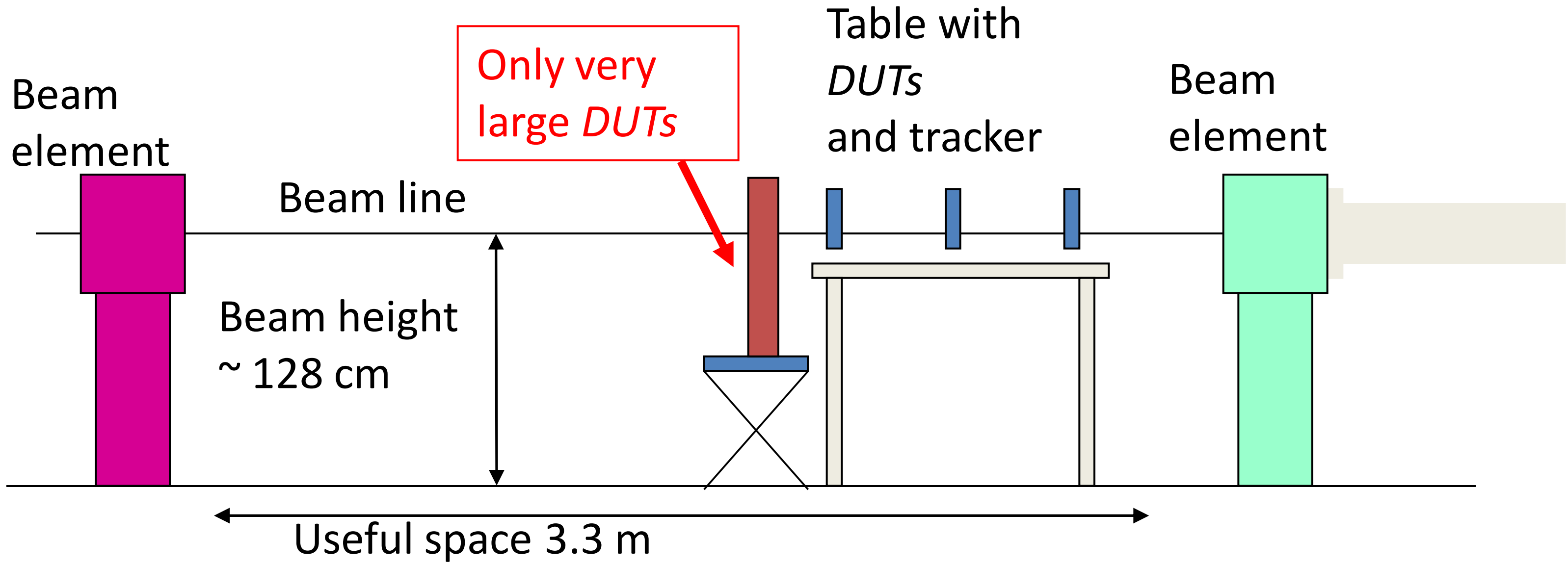


Issues for Setup B inside Goliath:

- Electronics rack is in a region with a 5-10mT fringe field
- Cables lenght can arrive up to more than 8 m

Setup "A" outside the magnet

- Placed upstream Goliath, composed by a table with precisely-positioned tracking elements and an external support for the case of very large *Detectors Under Test (DUTs)*



Setup “B” inside the magnet