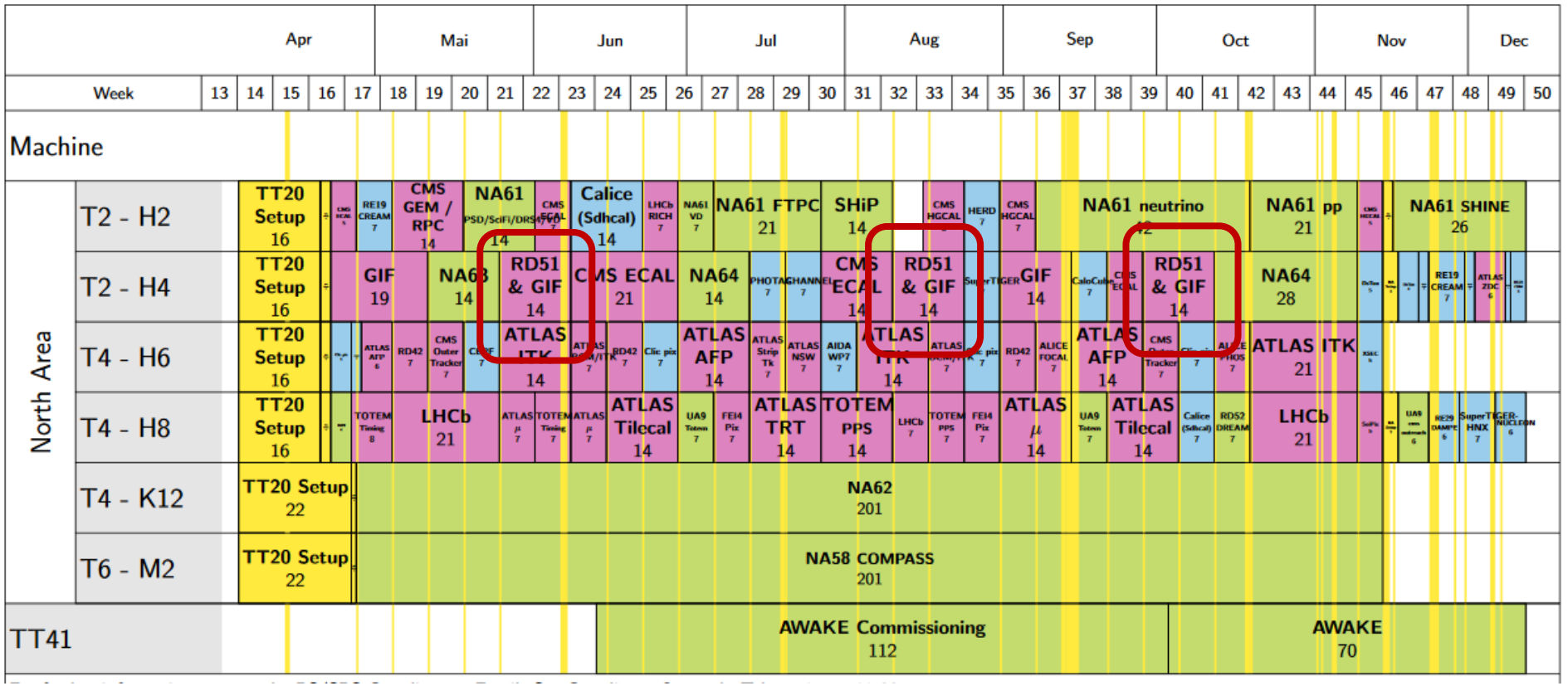
2016 RD51 test beam

SPS user schedule for 2016

schedule issue date: 22-Nov-2016 Version: 2.6.3 LHC Exp. PS/SPS Exp. INT Exp. Other Exp.



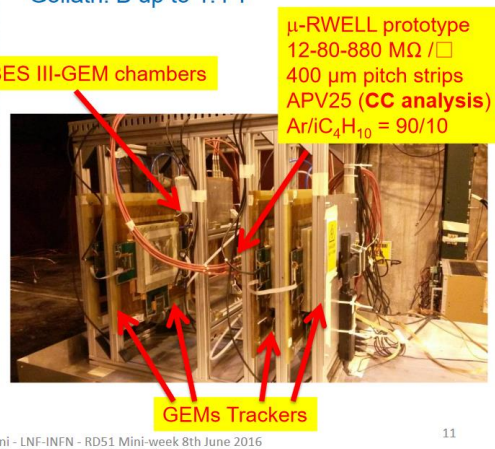
Three periods of two weeks each, 4 user/periods in average & GIF++

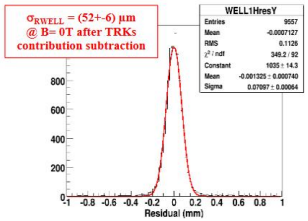
2016 Test beam measurements

- Characterization of (almost) final detector for experiment
- R&D for short term applications in experiments/application with almost standards MPGD technologies
- R&D for long term applications in experiments/application with novel MPGD based solution
- Pure R&D with MPGDs

The μ-RWELL performance: Beam Tests

H4 Beam Area (RD51)
Muon beam momentum: 150 GeV/c
Goliath: B up to 1.4 T



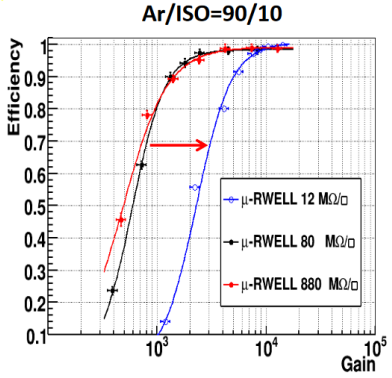


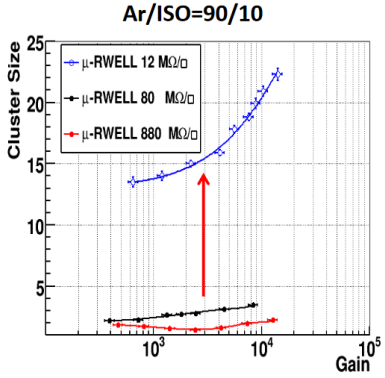
Test performed in H8 with larger prototype too…
See Morello Slides in this mini week…

https://indico.cern.ch/event/532518/contributions/2184447/attachments/1287085/1915054/Micro-RWELL-status-report-RD51-June-2016.pdf

CC analysis

μ-RWELL: tracking efficiency

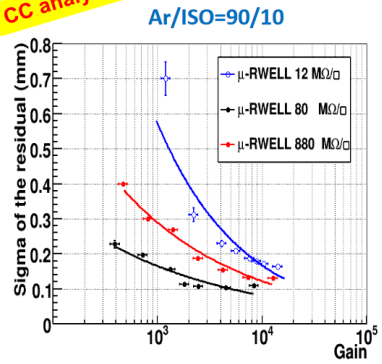


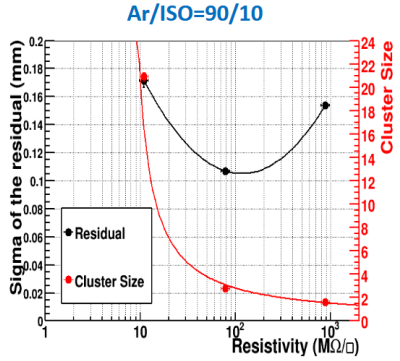


At **low resistivity the spread of the charge** (cluster size) on the readout strips **increases**, thus requiring a **higher gain** to reach the **full detector efficiency.**

Space resolution: orthogonal tracks

CC analysis





The **space resolution** exhibits a **minimum around 100MΩ/□.**
At **low resistivity** the **charge spread increases** and then **σ is worsening.**
At **high resistivity** the **charge spread is too small (Cl_size → 1)** then the Charge Centroid method becomes no more effective **(σ → pitch/√12).**

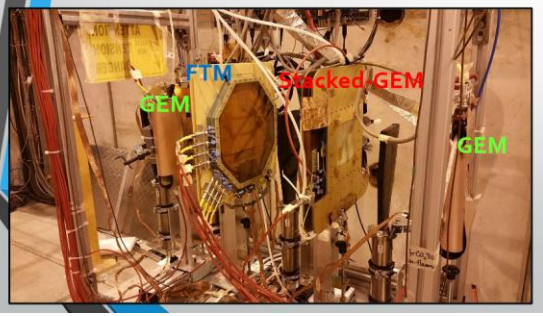
CMS GEM H_4 Test Beam

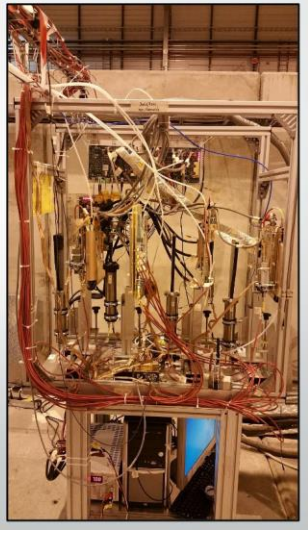
Ilaria Vai on behalf of the CMS GEM Collaboration

1

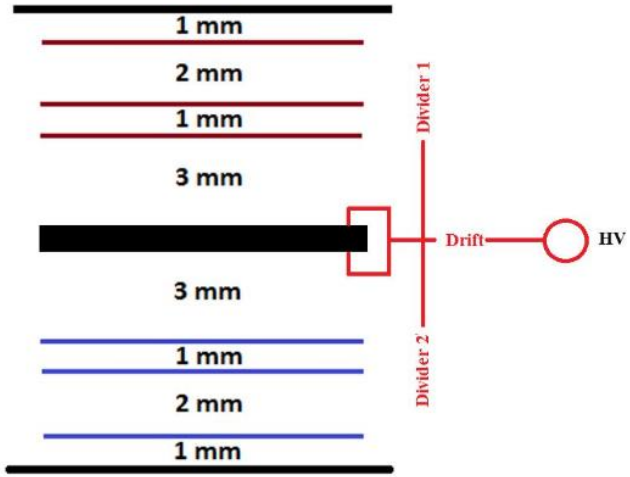
Setup

- A Stacked-GEM detector and a FTM detector under study
- Stacked-GEM detector with $Ar/CO_2/CF_4$ mixture
- 2 triple GEMs for tracking
- 3 PMTs and a Finger-PMT for trigger





2



Measurement performed with Stacked GEM

- Full characterization of the detector to measure spatial resolution, time resolution and efficiency with $Ar/CO_2/Cf_4$, to be compared with results of the previous test beam performed with Ar/CO_2
- Readout system: 4 VFATs mounted on the chamber (2 per side) + Turbo
- Spatial resolution and efficiency:
  - HV scan with different values of thresholds and latency of the VFATs

Time resolution:

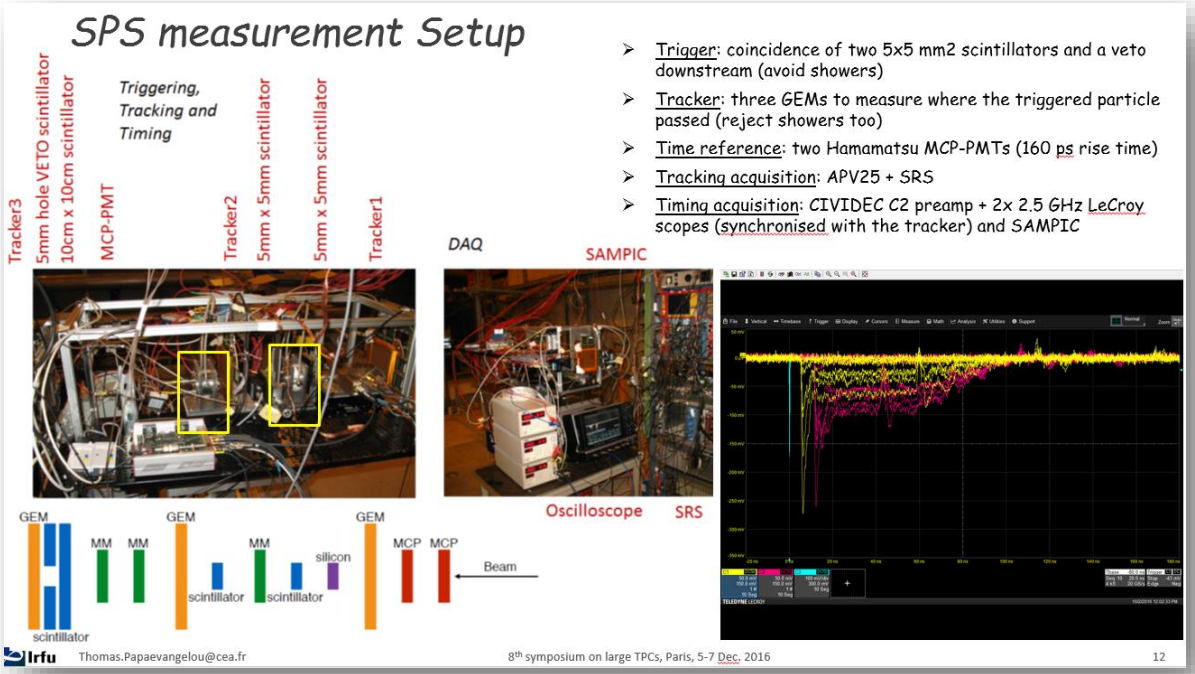
- Analysis of 2 VFATs installed on the two sides of the stack, in order to compare performance of the two Triple-GEM
- HV scan with fixed configuration of the VFATs
- Scans in Icomp, Ishaper and Threshold at fixed HV in order to find best configuration of parameters from the timing point of view

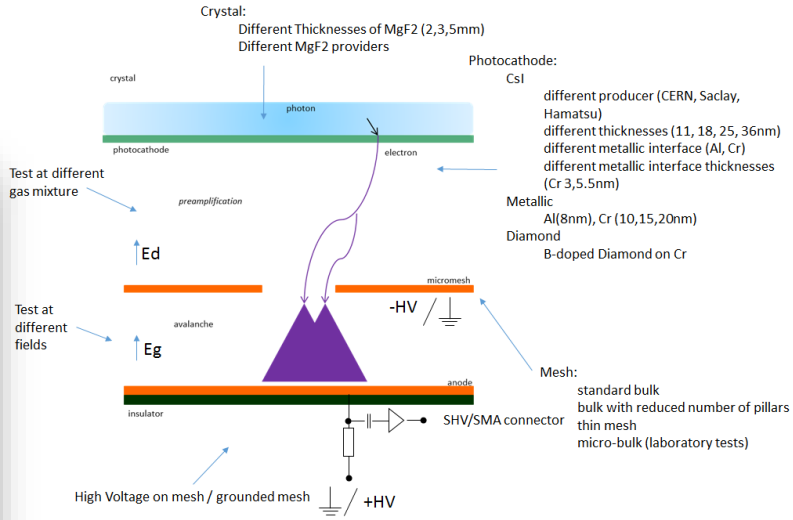
4

https://indico.cern.ch/event/532518/contributions/2195704/attachments/1287232/1915330/RD51MiniWeek_June.pdf

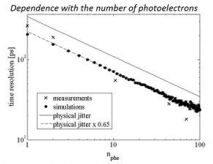
June

Picosec (May/June, August, September/October)

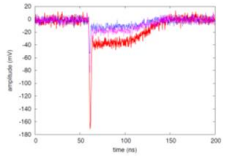




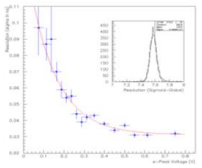
Current status of measurements, developments and tools of the Picosec Collaboration



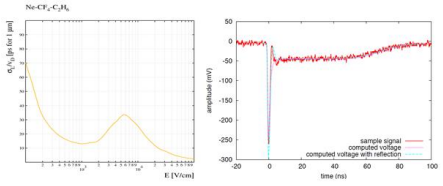
Photoelectron response (laser)



(Clean) MIPs Response (test beam)



Robust data analysis



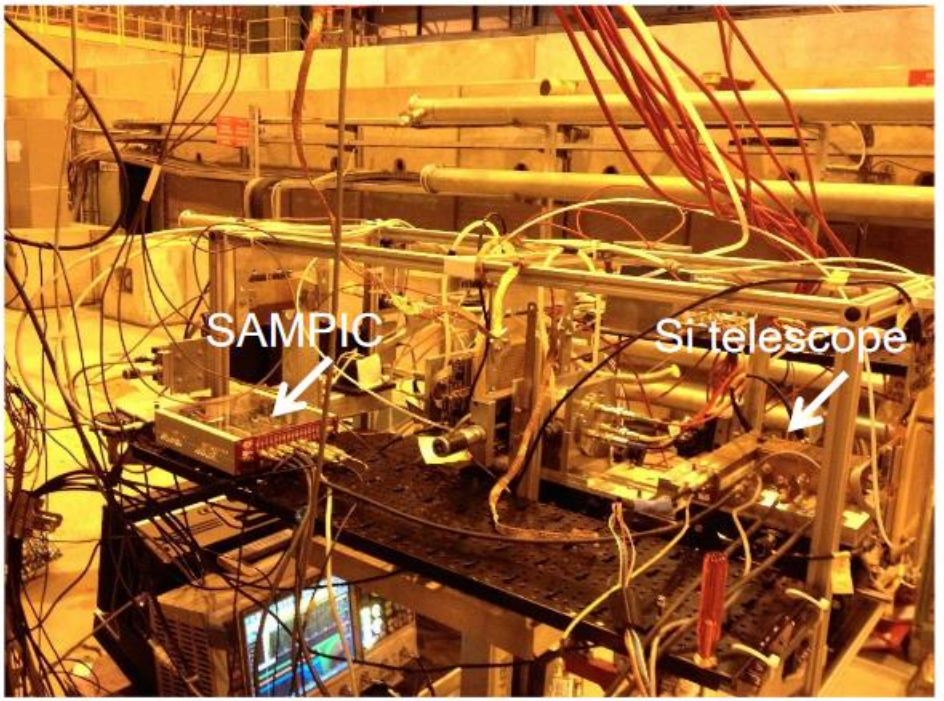
Simulation (and prediction) of Induced Signal

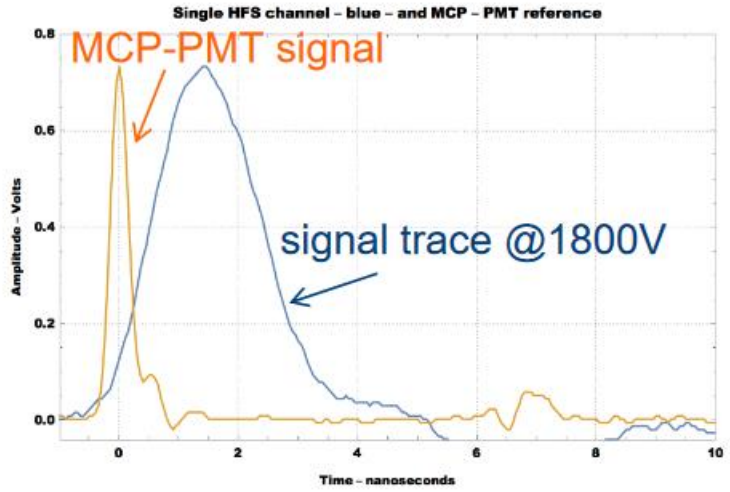
(https://indico.cern.ch/event/525268/contributions/2298965/attachments/1335651/2008896/aveiroSeb.pdf)
(https://indico.cern.ch/event/525268/contributions/2297868/attachments/1336635/2010819/testBeam.pdf)
(https://indico.cern.ch/event/532518/contributions/2195706/attachments/1287366/1915899/PicosecondeTestBeam.pdf)

June/August/October

Test-beam @ H4

- Sensors tested in parasitic mode
- Used both scope and SAMPIC multi-channel readout
  - SAMPIC is a waveform and time-to-digital converter
  - allows fine-time measurement (a few ps resolution)



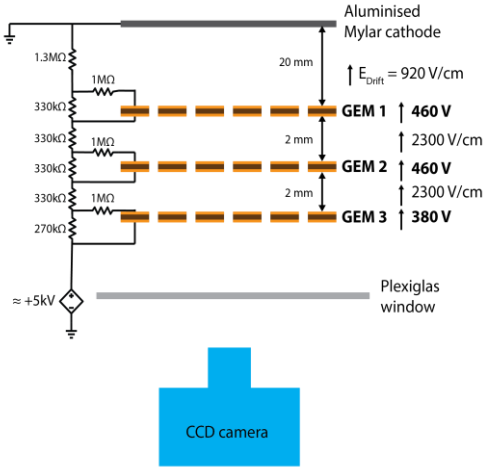


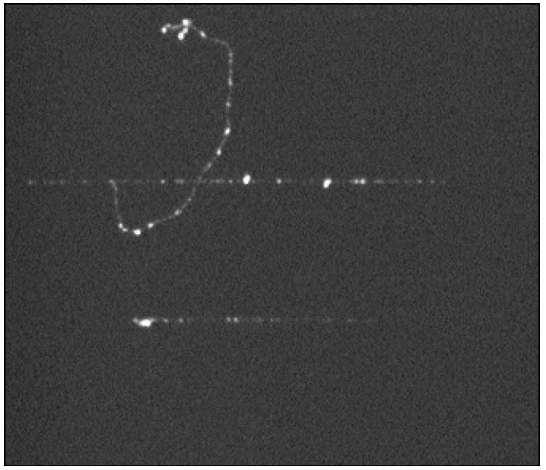
a) Setup with the SAMPIC and the Si telescope

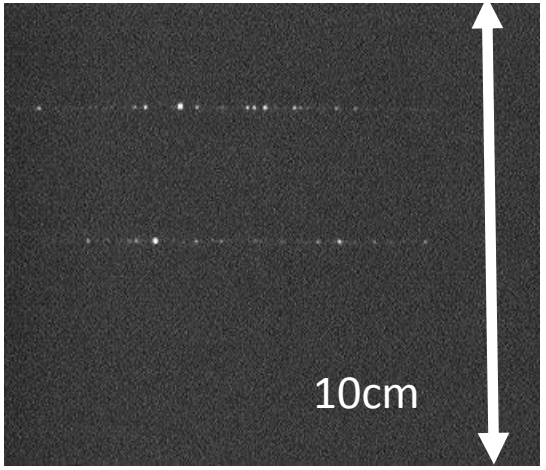
b) Signal trace @ 1800V and 50 dB preamp with MCP-PMT signal

June/August/October

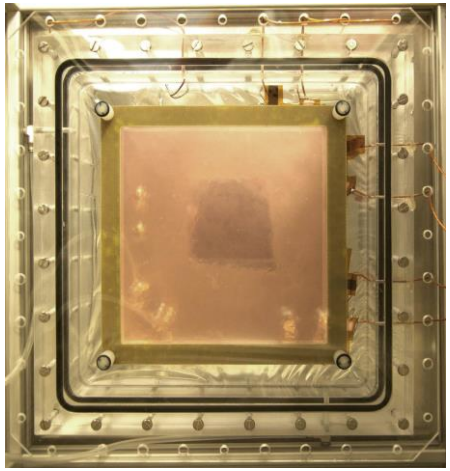
Optically read out GEM



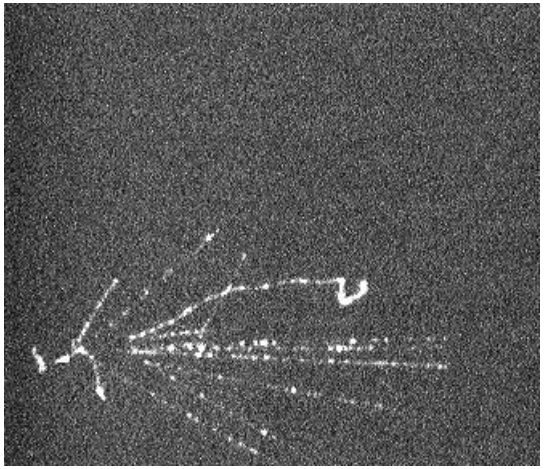


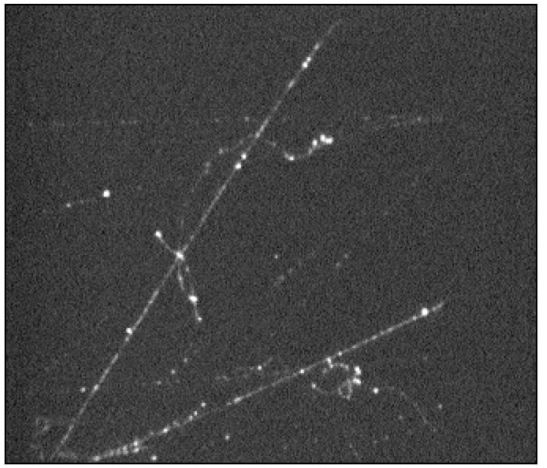


GEM read out by CCD



Muons, delta rays, hadronic showers

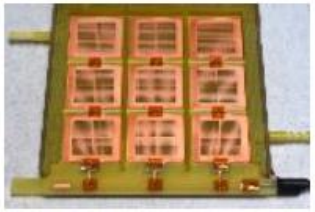




https://indico.cern.ch/event/532518/contributions/2195695/attachments/1287120/1915160/Brunbauer-MiniWeekJune2016-OpticalReadoutTestbeam.pdf

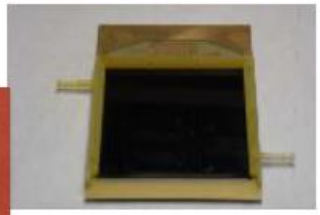
Position resolution test-beam study in RPWELL

The detector

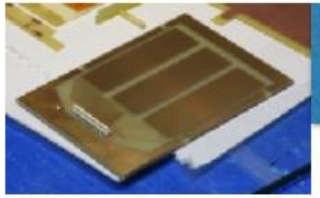


tiled glued detector

THGEM 0.8mm thick



resistive glass 0.7mm
- charge evacuation through graphite RL

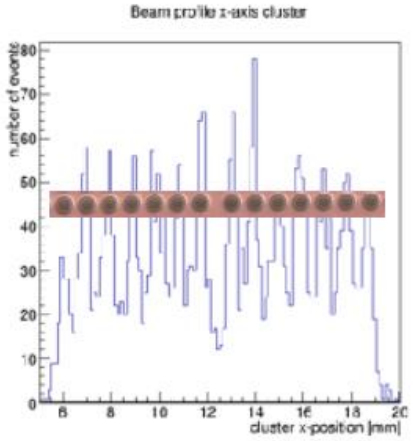


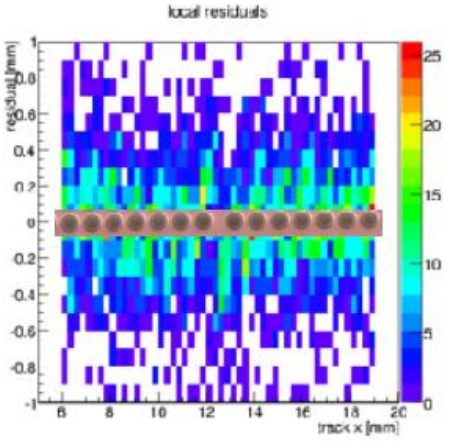
- readout: SRS/APV25 strips pitch 1mm

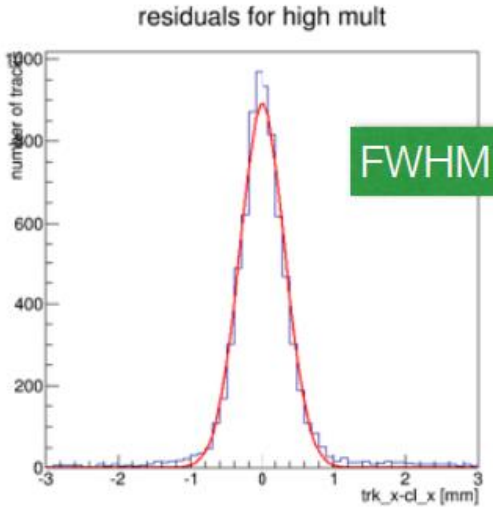
1.6 mm from THGEM

- gas: Ne/(5%CH_4)
- ΔV_{RPWELL} max 975V
- 50 Hz muons

Results





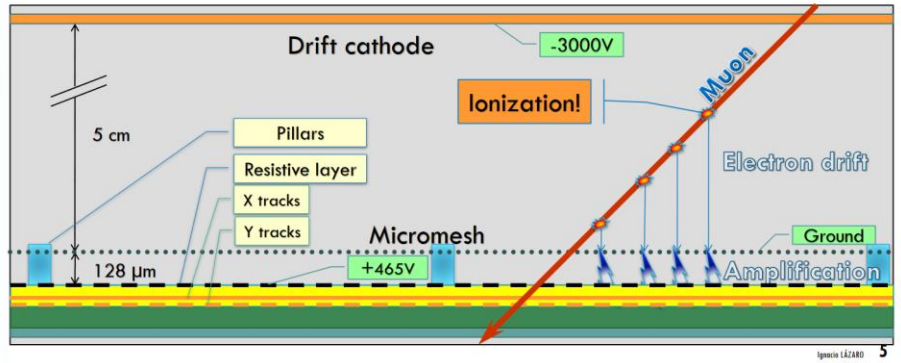


FWHM 660μm

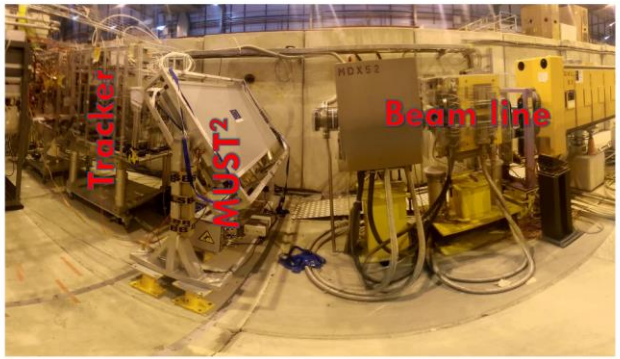
MUST² at test beam: first results

Ignacio Lázaro Roche on behalf of T2DM2

2. MUST² camera



3. Experimental setup

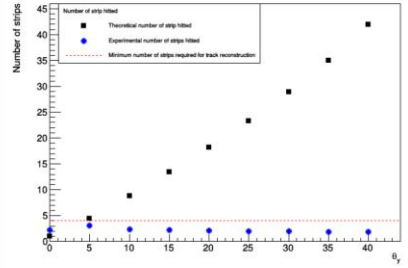


- Gas blend:
  Ar + CF_4 10% + Isobutane 2%
- Monitoring of V and I of the resistive layer.
- Fix Drift voltage at -3kV.
- Micromesh connected to ground.

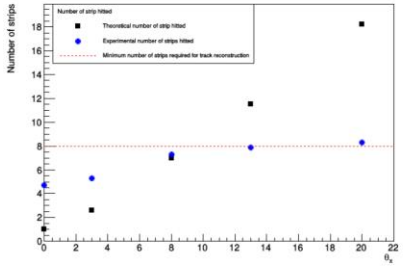
4.7 Track reconstruction (θ, ϕ)

Very preliminary results:

Number of strips hitted vs tilt



Number of strips hitted vs tilt



- The spread of the charge due to the angle of incidence reduces the amplitude of the signal.
- For tilted angles, the signal doesn't reach the acceptance threshold.
- The ratio of measured charge in both axis depends on the tilt angle and in some cases the signal is not strong enough to be considered in the data analysis.

https://indico.cern.ch/event/525268/contributions/2297865/attachments/1335481/2010657/Test_beam.pdf

August

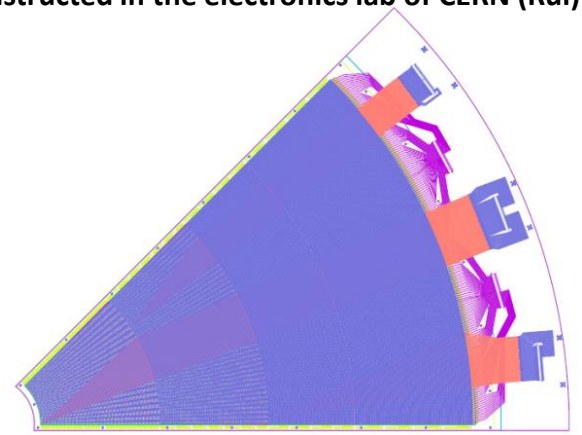
Demokritos
National Centre for Scientific Research

ARISTOTLE UNIVERSITY
OF THESSALONIKI

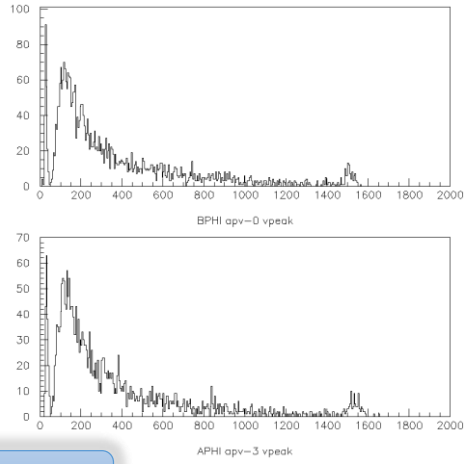
Tests of Micromegas octant prototypes towards a TPC Polarimeter for srEDM

George Fanourakis (N.C.S.R. "Demokritos"), Spyros Tzamarias, Ioannis Xiotidis (Aristotle University of Thessaloniki)

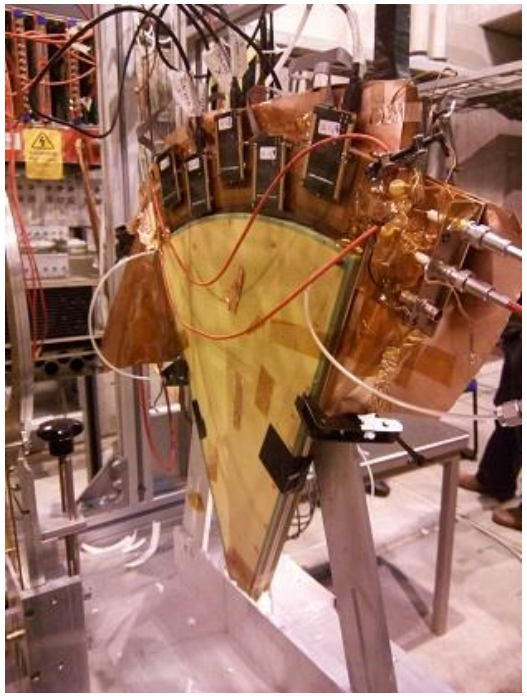
Two Bulk Micromegas (resistive) prototype octants with r-phi strip structure have been constructed in the electronics lab of CERN (Rui).



Landau distributions from Phi strips



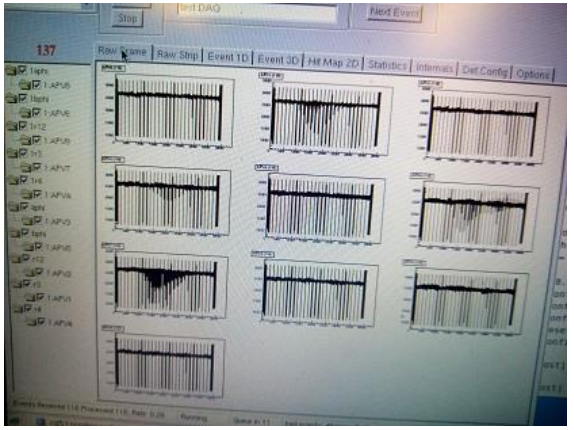
We tested a sandwich of 2 octants at RD51 test beam in October 2016.

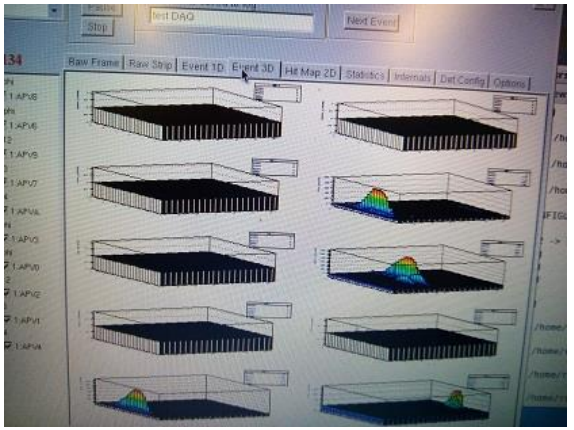


Data analysis in progress

Signals read by APVs using the SRS system. A total of 442 strips/channels per chamber

A muon recorded by both R-Phi chambers. (Upper 5 plots - chamber #1, lower 5 plots - chamber #2)

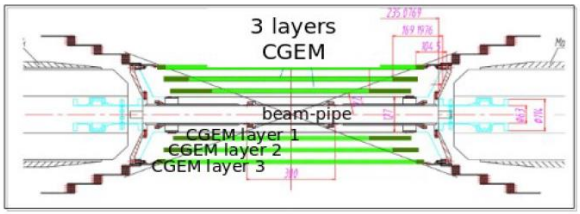


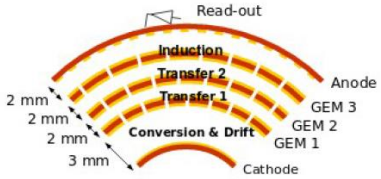


August/October

BESIII Project in RD51

(INFN Ferrara, Frascati, Torino)

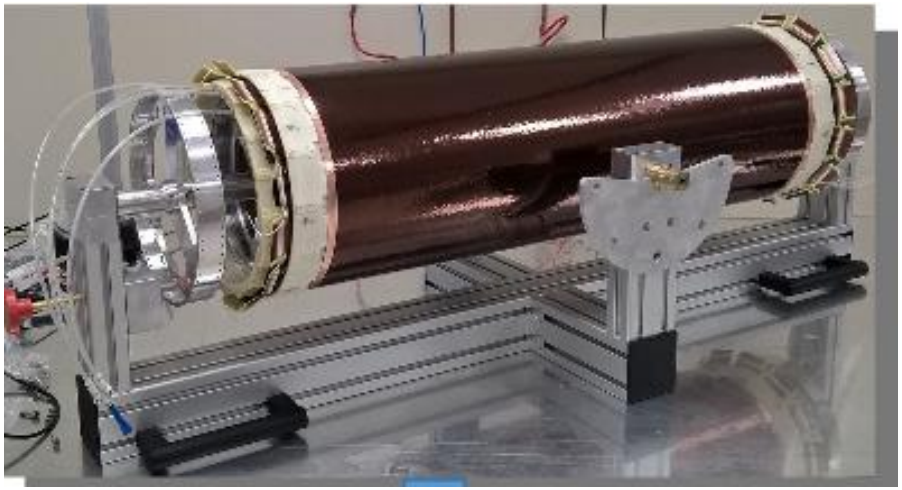




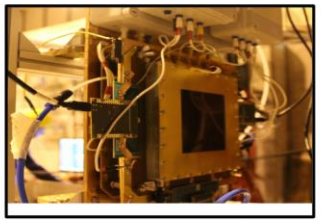
Requirements

- Rate capability: ~10^4 Hz/cm^2
- Spatial resolution: s_{xy} =~130μm : s_z=~1 mm
- Momentum resolution:: σ_{P_t}/P_t =~0.5% @1GeV
- Efficiency = ~98%
- Material budget ≤ 1.5% of X_0 all layers
- Coverage: 93% 4π
- Operation duration ~ 5 years

Combine the results of the charge centroid and μTPC to reach the required resolution

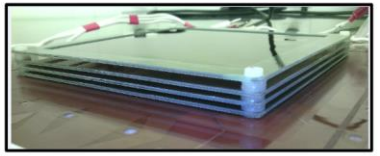


Tested chamber



The tested chamber are 10x10 cm^2 triple-GEM with:

- ArCO2 (70/30) and/or ArIso (90/10) gas mixtures
- XV or XY readout anode with 650 μm pitch strip



Beam test preliminary results - Geneva - Jun 08, 2016 R.Farinelli 4

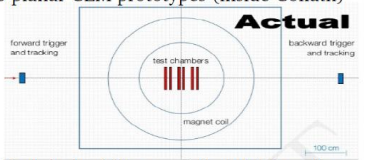
BESIII Activities at H4

(INFN Ferrara, Frascati, Torino)

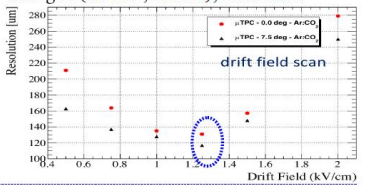
Develop a Cylindrical GEM with analog and time readout as new Inner Tracker for BESIII combining charge centroid and μTPC readout

May-June 2016

6 planar GEM prototypes (inside Goliath)



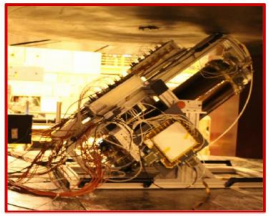
Exploit the full potential of uTPC readout wrt: gas (ArCO2, ArISO), Drift field



In 1 T magnetic field σ_x lower than 120 μm

October 2016

First test of the cylindrical prototype



Compare the performances of the CGEM with respect planar GEM

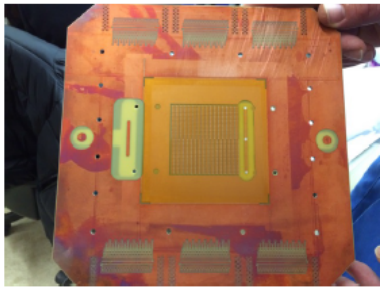
First preliminary results, with no magnetic field, shows behaviour is similar between GEM and CGEM

Spatial resolution ~ 130 μm

https://indico.cern.ch/event/532518/contributions/2195708/attachments/1287370/1915545/20160608.RD51_WG7.pdf

June/October

Small-Pads Resistive MM Test beam @ SPS H4

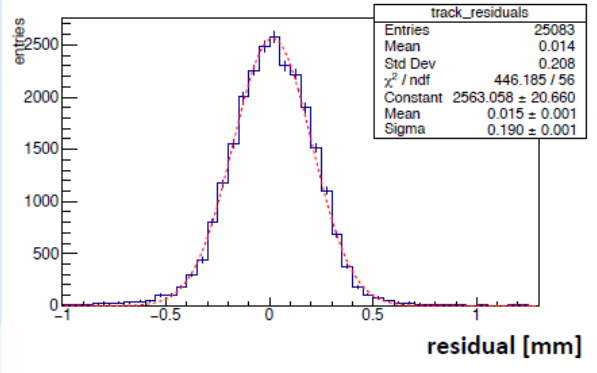


Test Setup:

- Small-pads (1x3 mm^2) MM with Ar/CO2 93/7
- 2 double readout (xy) small size bulk micromegas as reference + 2 trigger scintillators
- DAQ: SRS+APV25

Data taken with high energy muons/pions beam to study:

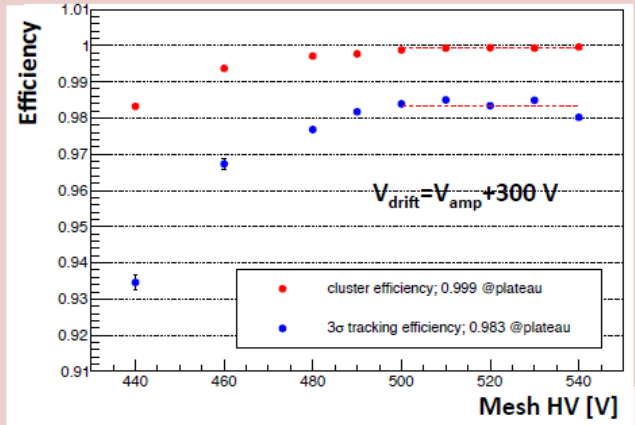
- Efficiency Vs HV;
- Spatial resolution;
- Inclined tracks
- Low/high intensity beam → rate capability
- Only results with perpendicular muons are reported.

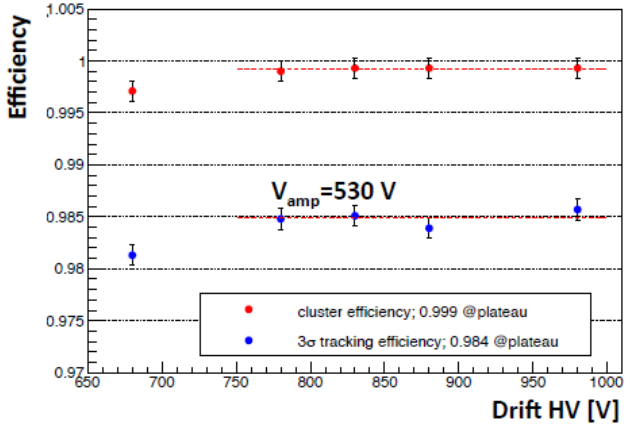


Precision coordinate residuals distribution: difference btw the position measured from Pad-mm positionn and the reference track. → $\sigma_x \approx 190\ \mu m$

Cluster and tracking efficiency

vs drift and amplification voltage.





http://indico.cern.ch/event/588409/contributions/2379812/attachments/1387526/2112329/PadMM_RD51_131216.pdf

SHIP (emulsion) + mm

In 2015 with GEM

For 2017 request of beam time (GEM)

We will ask them for updates and reports on the measurements done up to now to share with our community.

October – 1day run

2017

- Usual number/length periods requested
- RD51&GIF++ … asked for one of the three period as main (preferably the last one)
- Three requests received already:
  - BESIII
  - microresistive well,
  - SHIP (emulsion) + GEM