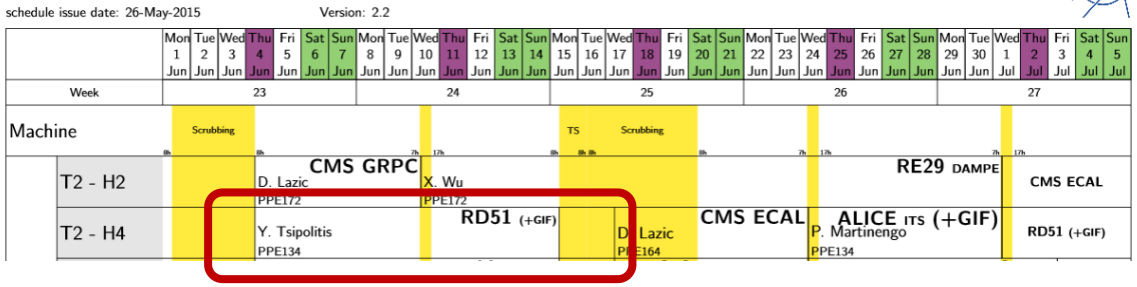
wg7

2015 Test Beam Activities

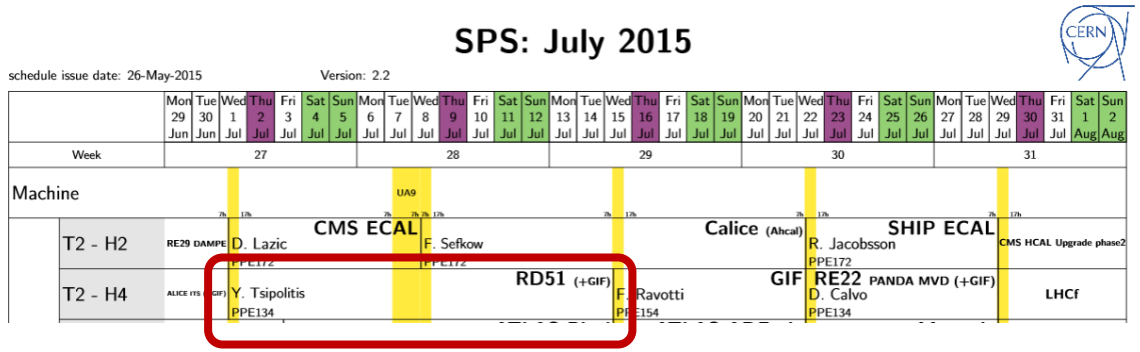
RD51 2015 Test Beam

- Brief Summary of June and July Test Beam
- Plans for the October/November Test beam
- Test Beam 2016

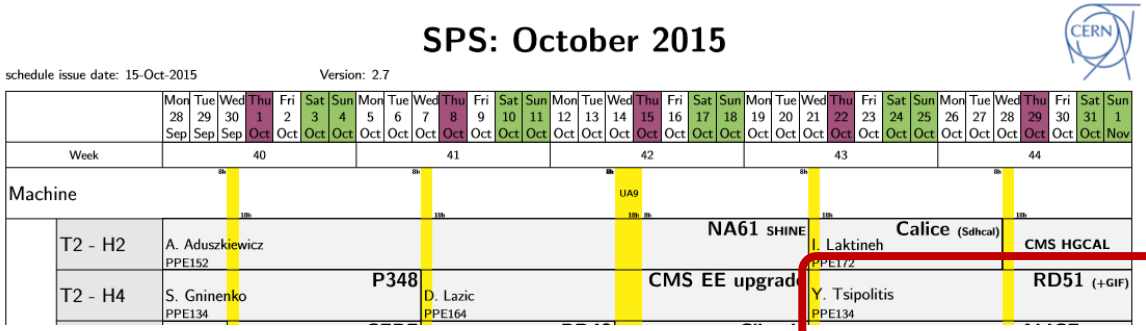
SPS: June 2015



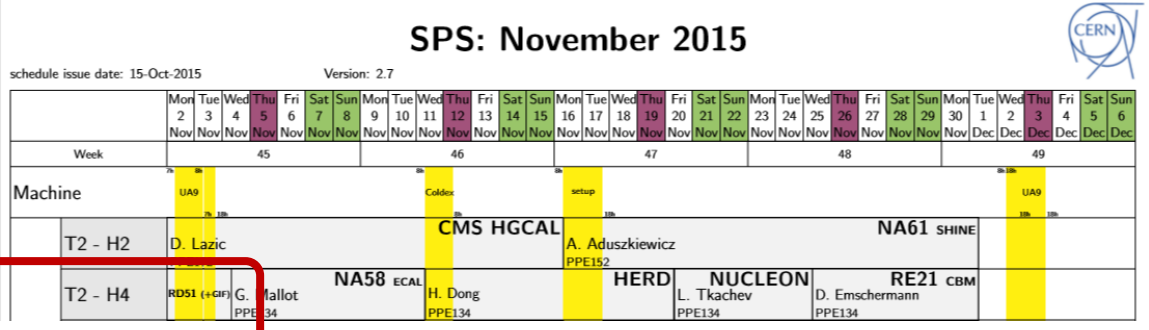
SPS: July 2015



SPS: October 2015



SPS: November 2015

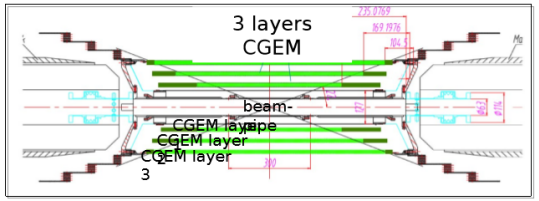


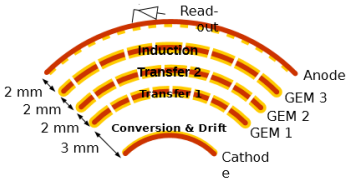
A CGEM Inner Tracker for BESIII

(LNF, Ferrara)

The Italian group is leading the development of a cylindrical GEM inner tracker for BESIII.

The project has been recently selected as one of the project funded by the European Commission within the call H2020-MSCA-RISE-2014.





Requirements

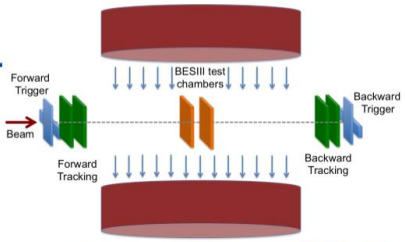
- Rate capability: ~10^4 Hz/cm^2
- Spatial resolution: σ_{xy} =~120μm : σ_z=~1 mm
- Momentum resolution:: σ_{pt}/P_t =~0.5% @1GeV
- Efficiency = ~98%
- Material budget ≤ 1.5% of X_0 all layers
- Coverage: 93% 4π
- Operation duration ~ 5 years

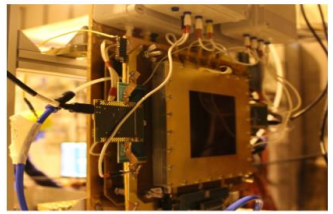
https://indico.cern.ch/event/392637/session/5/contribution/27/attachments/785354/1076521/RD51MiniweekMeeting2015.06.09.pdf

The new setup

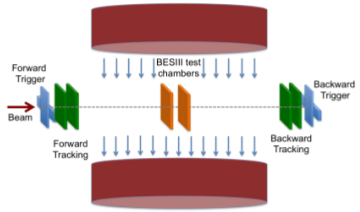
We are performing a new beam test to complete the planned set of measurements.

A new chamber with a different anode layout has been added to the setup.



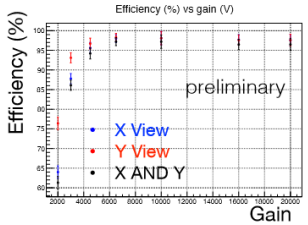


Test Beam Results



We performed two beam test at CERN to test planar prototypes inside a magnetic field.

- validate analogue readout
- validate Garfield simulation
- test different gas and geometry configurations



The efficiency plateau starts at about a gain of 6000. Efficiency for 2 dimensional clusters ~97%.

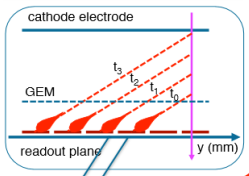
With **no magnetic** field and 650 μm strip pitch we achieved about 90 μm of spatial resolution with Ar/Isob (90/10) gas mixture.

test chamber readout by APV25 hybrids

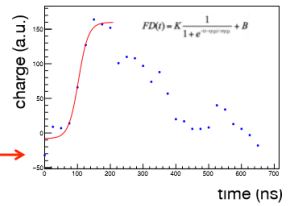
MPGD 2015 – RD51 Collaboration Meeting:
https://agenda.infn.it/getFile.py/access?contribId=28&sessionId=2&resId=0&materialId=slides&confId=8839

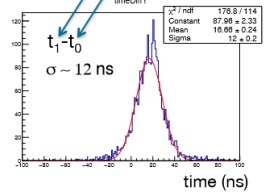
μTPC readout feasibility study

For diagonal tracks and/or in high magnetic field

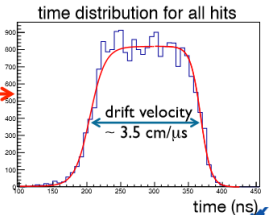


- Exploring a μTPC readout to further improve the spatial resolution
- Fit the charge samples to extract the drift time
- ~12 ns time resolution





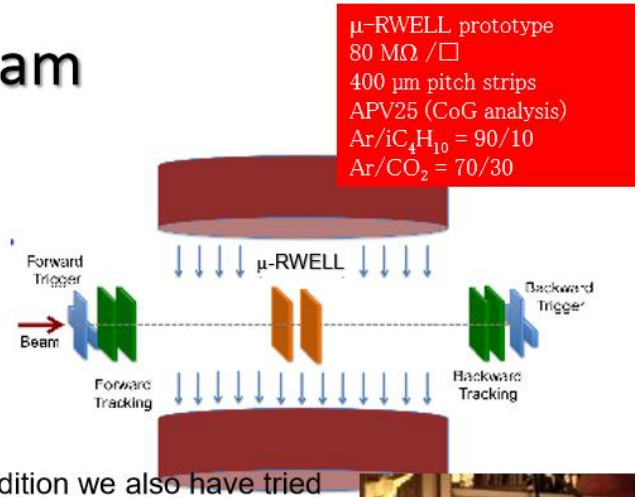
- The electron drift velocity can be extracted by the hit time distribution and its consistent with simulations.
- The track can be reconstructed from the time measurement.



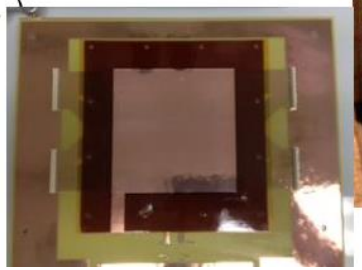
µ-RWELL (LNF)

June 2015 Test Beam

- µ-RWELL prototype
  80 MΩ /□
  400 µm pitch strips
  APV25 (CoG analysis+
  micro-TPC mode)
  Ar/iC4H10 = 90/10
  Ar/CO2 = 70/30
- 4 GEM Trackers outside magnetic field
- HV scan, B scan
- Incident angle scan

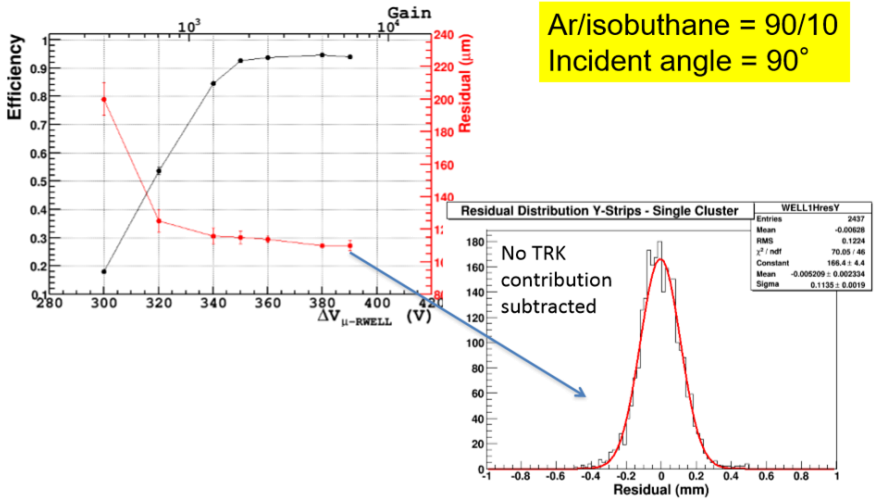


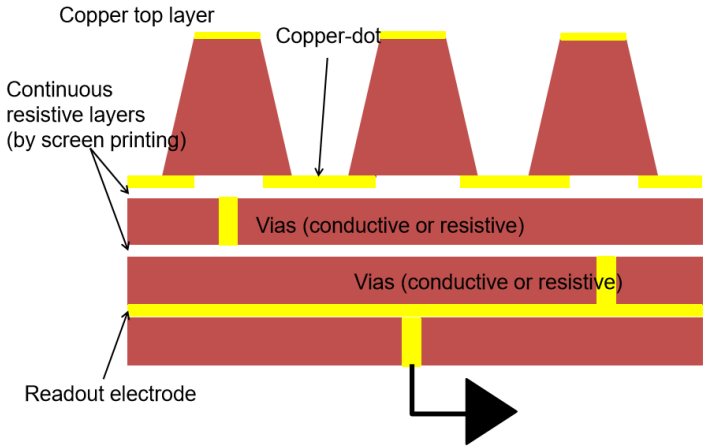
In addition we also have tried to test a new µ-RWELL prototype with a suitable "current evacuation" scheme (but ..)



Test Beam Results 2015

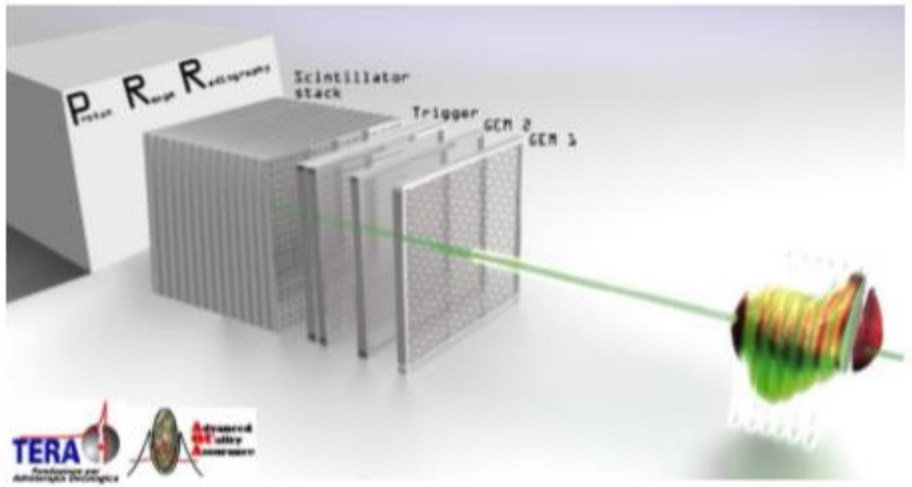
Ar/isobuthane = 90/10
Incident angle = 90°





https://indico.cern.ch/event/392637/session/5/contribution/28/attachments/785358/1076536/MiniWeeek_2015_test_beam.pdf

Proton Range Radiography (TERA)



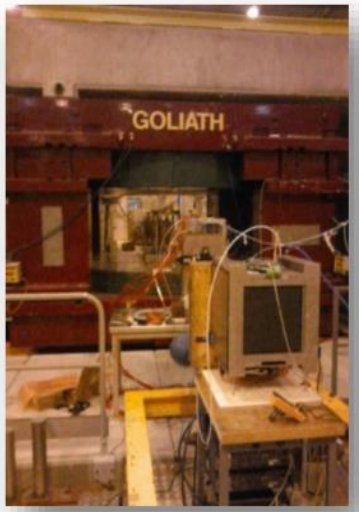
New Proton Range Radiograpy telescope – **PRR30**

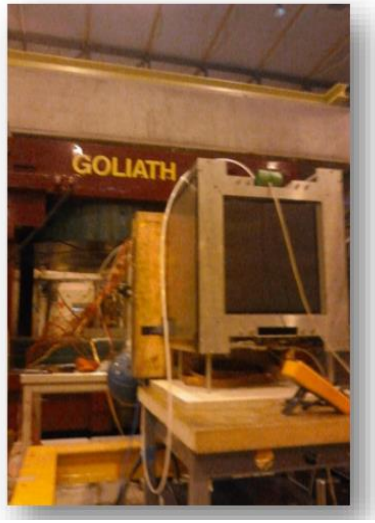
- Scintillator stack
  - 48 Plastic scintillators 30x30 cm^2 3 mm each (15 cm water equivalent)
  - WLS fiber to SiPM

30MeV to 190MeV Residual Energy

- Tracker
  - Two 30x30 cm^2 triple-GEM detectors (Compass style)
  - 2D XY strip readout (800 um pitch)
  - Readout electronics capable of 1M events/sec

⇨ New electronic development

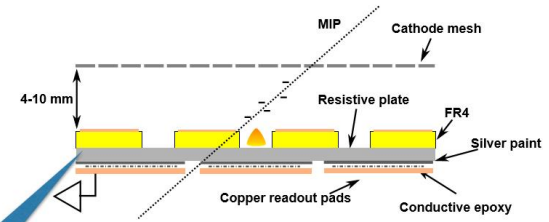




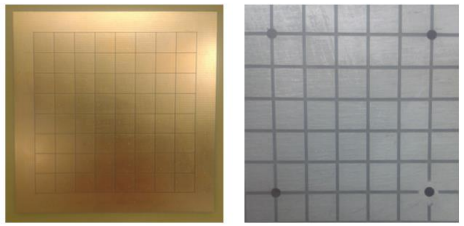
https://indico.cern.ch/event/365380/session/6/contribution/54/attachments/726455/996903/Bucciantonio_PRR_2015_03_20.pdf

The RPWELL (WIS/Coimbra/Aveiro)

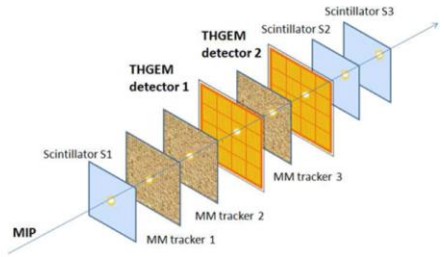
a single sided THGEM coupled to anode through a resistive plate (http://iopscience.iop.org/1748-0221/8/11/P11004)



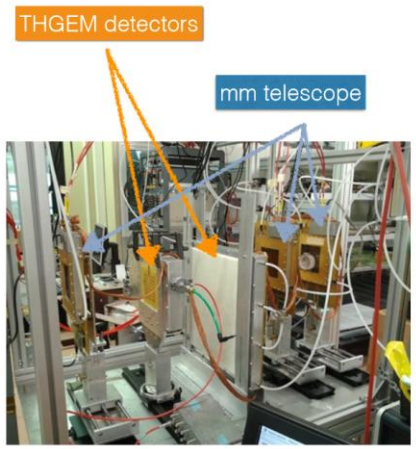
0.4 mm Semitron ESD225 (bulk resistivity 10^8 Ωcm)



Test beam setup



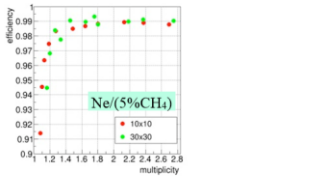
- RD51 mm telescope
  - 3 scintillators (100x100 mm^2 coverage)
  - 3 micromegas for precision tracking
- Two THGEM chambers
- Common DCS (HV control and monitoring)



https://indico.cern.ch/event/392637/session/5/contribution/30/attachments/785380/1076571/RD51_MiniWeek-1506.pdf

Beam studies	$Ne/(5\%CH_4)$ - $Ar/(5\%CH_4)$ - $Ar/(7\%CO_2)$
150 GeV μ & π beams	Efficiency & Multiplicity

- Higher multiplicity for 30×30 cm^2 compared to that of 10×10 cm^2 detectors
  - Analysis not final
- Also related to the naive production used
  - Misalignment between the readout pads and painted pads on the resistive sheet
- Will be done more carefully in the new detector

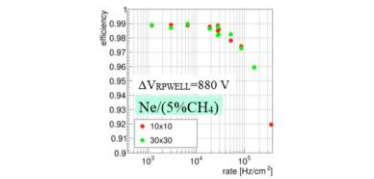


Gas gain ~10^4; effective gain ~10^3

10×10 cm^2 - Discharge-free operation also at high rate π-beam

Beam studies	$Ne/(5\%CH_4)$ - $Ar/(5\%CH_4)$ - $Ar/(7\%CO_2)$
150 GeV μ & π beams	Rate capabilities

- Similar rate dependence for both 10×10 cm^2 & 30×30 cm^2 detectors
- ~5% efficiency loss over 3 orders of rate magnitudes
  - Can be avoided by defining higher nominal operation voltage
  - Still maintain discharge-free operation



10×10 cm^2 - Discharge-free operation also at high rate π-beam

MPGD 2015 – RD51 Collaboration Meeting:
https://agenda.infn.it/getFile.py/access?contribId=8&sessionId=2&resId=0&materialId=slides&confId=8839

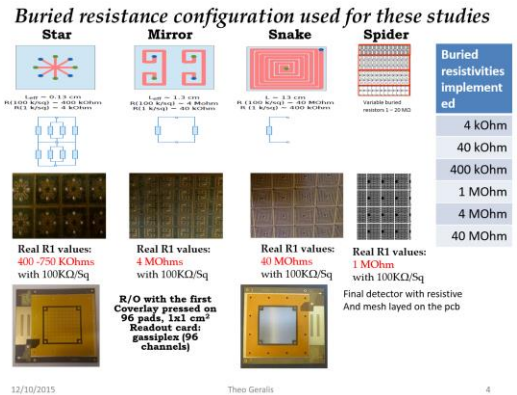
Development of Resistive Micromegas for Sampling Calorimetry

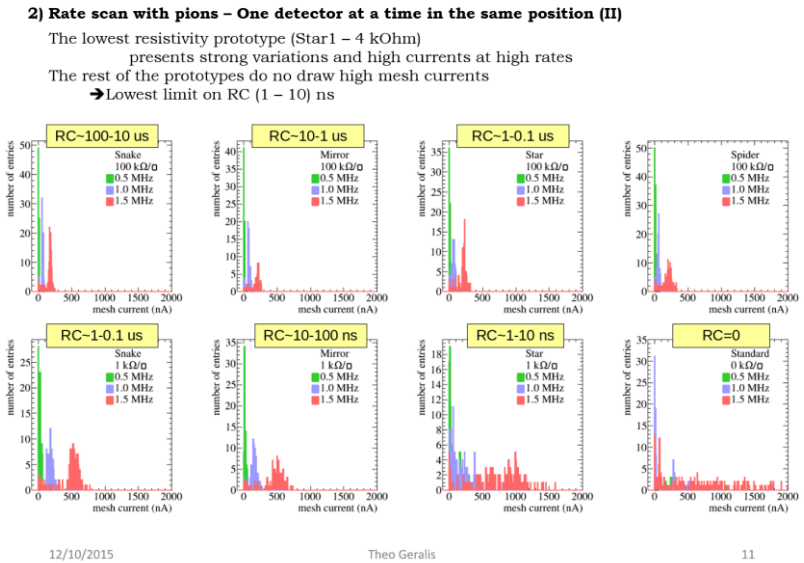
Sampling Calorimetry with Resistive Anode Micromegas

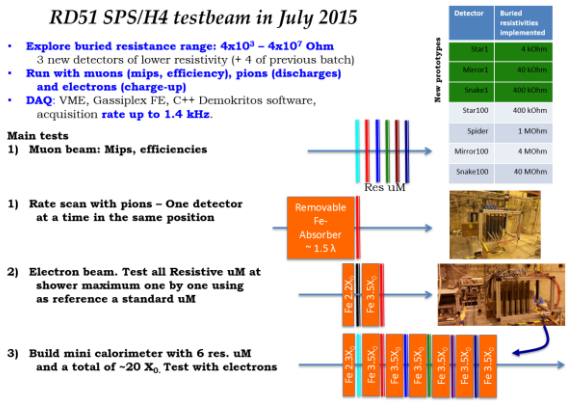
(SCREAM)

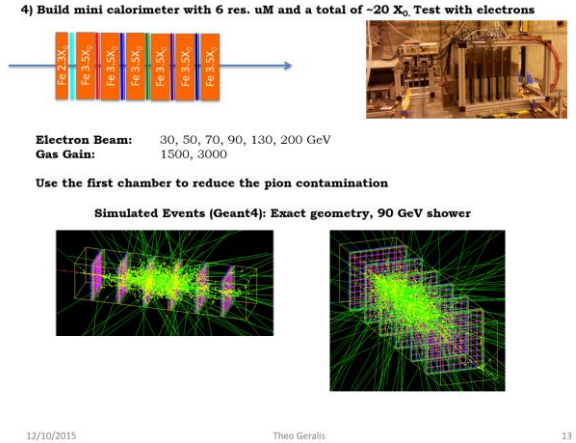
(LAPP/NCSR/CEA)

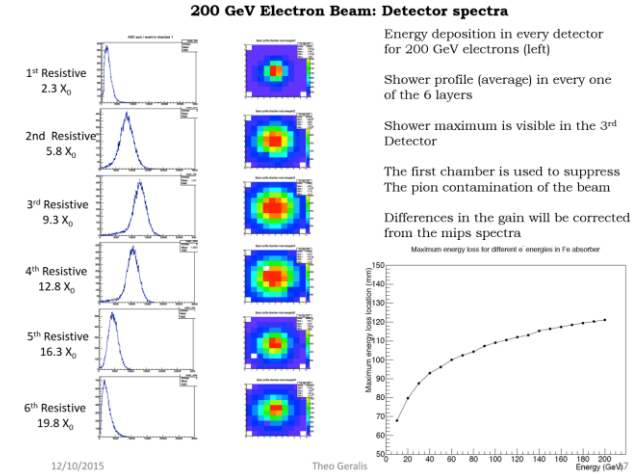
MPGD 2015 – RD51 Collaboration Meeting:
https://agenda.infn.it/getFile.py/access?contribId=109&sessionId=2&resId=0&materialId=slides&confId=8839





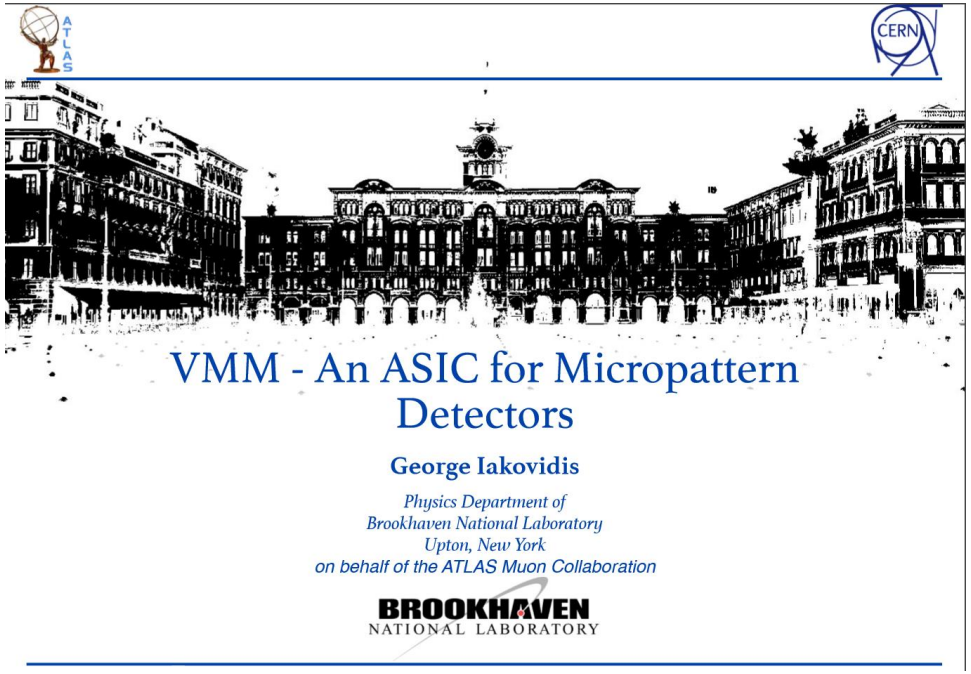






https://indico.cern.ch/event/392637/session/5/contribution/31/attachments/785379/1076570/wg7_09062015.pdf

ATLAS & VMM (ATLAS NSW mm)

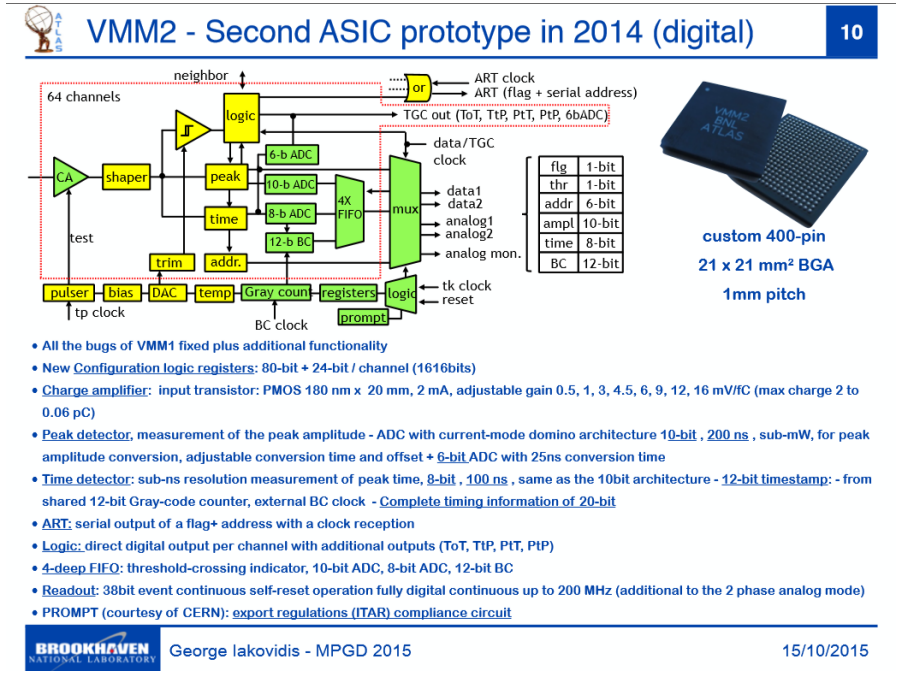


VMM - An ASIC for Micropattern Detectors

George Iakovidis

Physics Department of
Brookhaven National Laboratory
Upton, New York
on behalf of the ATLAS Muon Collaboration

BROOKHAVEN NATIONAL LABORATORY



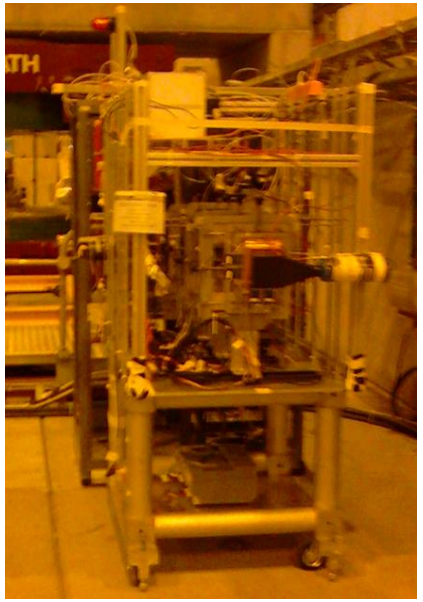
Preliminary test during the July test beam of the VMM2 on the RD51 Hybrid (SRS)

P348:
Search for new physics in missing-energy events

D.Banerjee (ETH, Zurich)

P348 Test Beam Report:
https://indico.cern.ch/event/385594/contribution/7/7/attachments/1171005/1690559/p348_gninenko_SPSC.pdf

Essential support from the ATLAS NSW mm group for the DAQ (mmDAQ) and analysis (recomm)



RD51 Tracker

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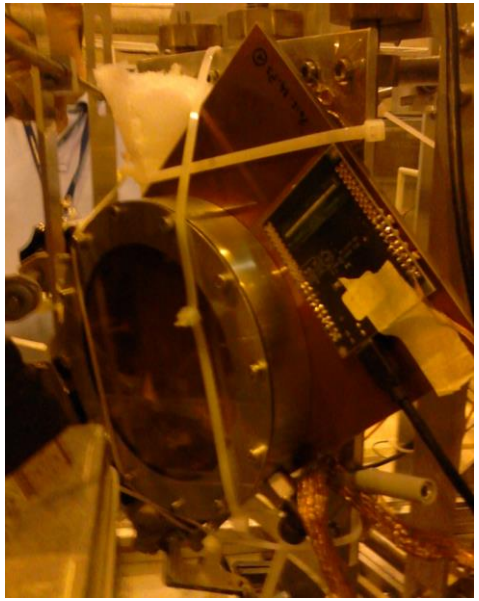

P348 resistive mm with RD51 APV25

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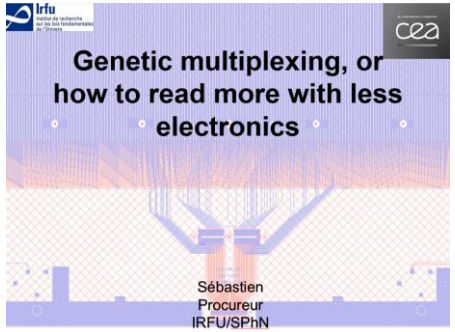

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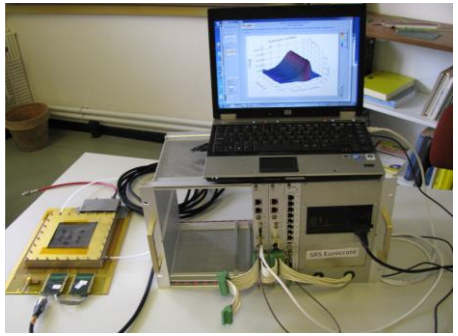

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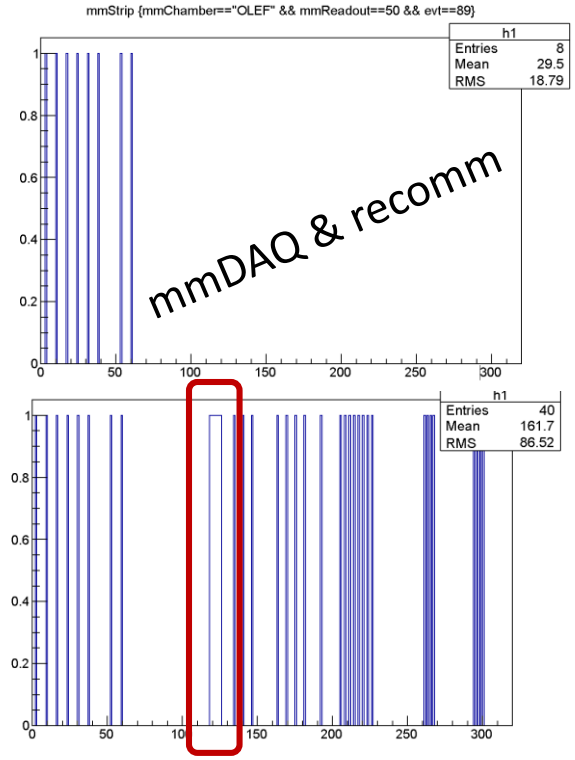


Konstantinos Ntekas

Preliminary test during the RD51 July test beam (few days of the full period) in view of the P348 Test Beam

SPS: October 2015

schedule issue date: 15-Oct-2015 Version: 2.7

	Mon 28 Sep	Tue 29 Sep	Wed 30 Sep	Thu 1 Oct	Fri 2 Oct	Sat 3 Oct	Sun 4 Oct	Mon 5 Oct	Tue 6 Oct	Wed 7 Oct	Thu 8 Oct	Fri 9 Oct	Sat 10 Oct	Sun 11 Oct	Mon 12 Oct	Tue 13 Oct	Wed 14 Oct	Thu 15 Oct	Fri 16 Oct	Sat 17 Oct	Sun 18 Oct	Mon 19 Oct	Tue 20 Oct	Wed 21 Oct	Thu 22 Oct	Fri 23 Oct	Sat 24 Oct	Sun 25 Oct	Mon 26 Oct	Tue 27 Oct	Wed 28 Oct	Thu 29 Oct	Fri 30 Oct	Sat 31 Oct	Sun 1 Nov
Week	40							41							42							43							44							
Machine																		UA9																	
T2 - H2	A. Aduszkiewicz PPE152																							I. Laktineh											
T2 - H4	S. Gninenko PPE134							D. Lazic PPE164																Y. Tsipolitis PPE134											

NA61 SHINE

Calice (Sdhcal)

CMS HGCAL

P348

CMS EE upgrade

RD51 (+GIF)

SPS: November 2015

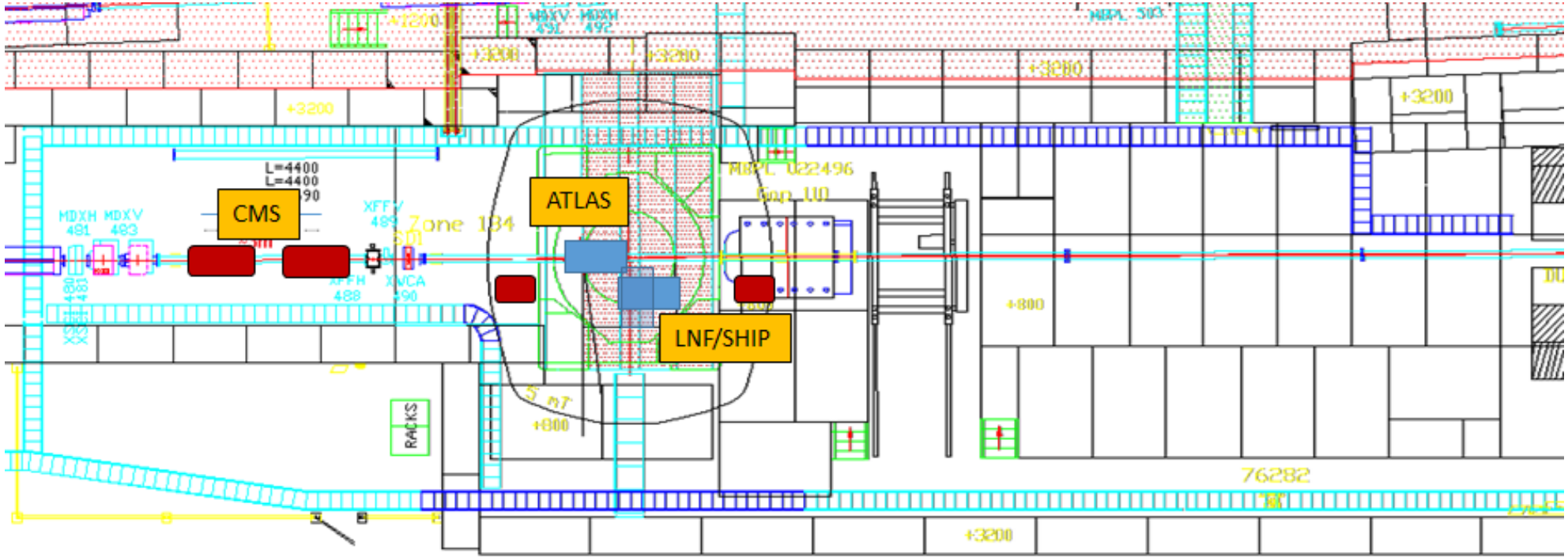
schedule issue date: 15-Oct-2015 Version: 2.7

	Mon 2 Nov	Tue 3 Nov	Wed 4 Nov	Thu 5 Nov	Fri 6 Nov	Sat 7 Nov	Sun 8 Nov	Mon 9 Nov	Tue 10 Nov	Wed 11 Nov	Thu 12 Nov	Fri 13 Nov	Sat 14 Nov	Sun 15 Nov	Mon 16 Nov	Tue 17 Nov	Wed 18 Nov	Thu 19 Nov	Fri 20 Nov	Sat 21 Nov	Sun 22 Nov	Mon 23 Nov	Tue 24 Nov	Wed 25 Nov	Thu 26 Nov	Fri 27 Nov	Sat 28 Nov	Sun 29 Nov	Mon 30 Nov	Tue 1 Dec	Wed 2 Dec	Thu 3 Dec	Fri 4 Dec	Sat 5 Dec	Sun 6 Dec
Week	45							46							47							48							49							
Machine		UA9								Coldex						setup															UA9				
T2 - H2	D. Lazic										CMS HGCAL				A. Aduszkiewicz PPE152																				
T2 - H4	RD51 (+GIF)	G. Mallot PPE134									H. Dong PPE134							HERD		NUCLEON L. Tkachev PPE134					RE21 CBM D. Emschermann PPE134										

NA58 ECAL

NA61 SHINE

October-November 2015



ATLAS NSW micromegas upgrade: test of mm and of the new FE electronics (ATLAS VMM) in magnetic field.

CMS GEM collaboration: test of the super module detectors for the slice test, of the new electronics and DAQ and timing and efficiency test of a new prototype.

LNF(SHIP): Space resolution studies of GEM and microResistiveWELL in magnetic field. Both detectors will be coupled with emulsion bricks for a reduced part of the measurements.

Request for Beam Time at the PS & SPS in 2016

Please fill out this form by editing its electronic version (http://sps-schedule.web.cern.ch/sps-schedule/2016/beam_request_form_2016.docx) on your computer using *Word* or *OpenOffice*, save the file as EXPERIMENT_NAME-beam_request_2016.docx, and upload it to the share point: https://espace.cern.ch/PS-SPS-User-Documents/2016%20Beam%20time%20requests latest by November 21st 2015.

Three periods of two weeks each: Spring (May/June), Summer (July/August), Fall (October/November)

Summary

About 6 weeks and 9 users in total

- R&D on (new) MPGD structures (RPWELL, μRWELL, embedded Pad Resistive Micromegas)
- Detector (prototypes) optimization and characterization (BESIII CGEM, CMS GEM, ATLAS mm)
- Detector (final design or very close) Characterization (PRR30, ATLAS NSW, CMS GEM)
- FE Electronics and DAQ (ATLAS NSW mm - VMM, CMS GEM VFAT2 & DAQ, P348 genetic readout resistive micromegas and SRS/APV25)

- Operation in Magnetic Field (1.5T max) – Very precious tool for the community

2016 request: 3 periods of 2 weeks each (deadline: November 21st)