

Test Beam Status & News

Eraldo Oliveri

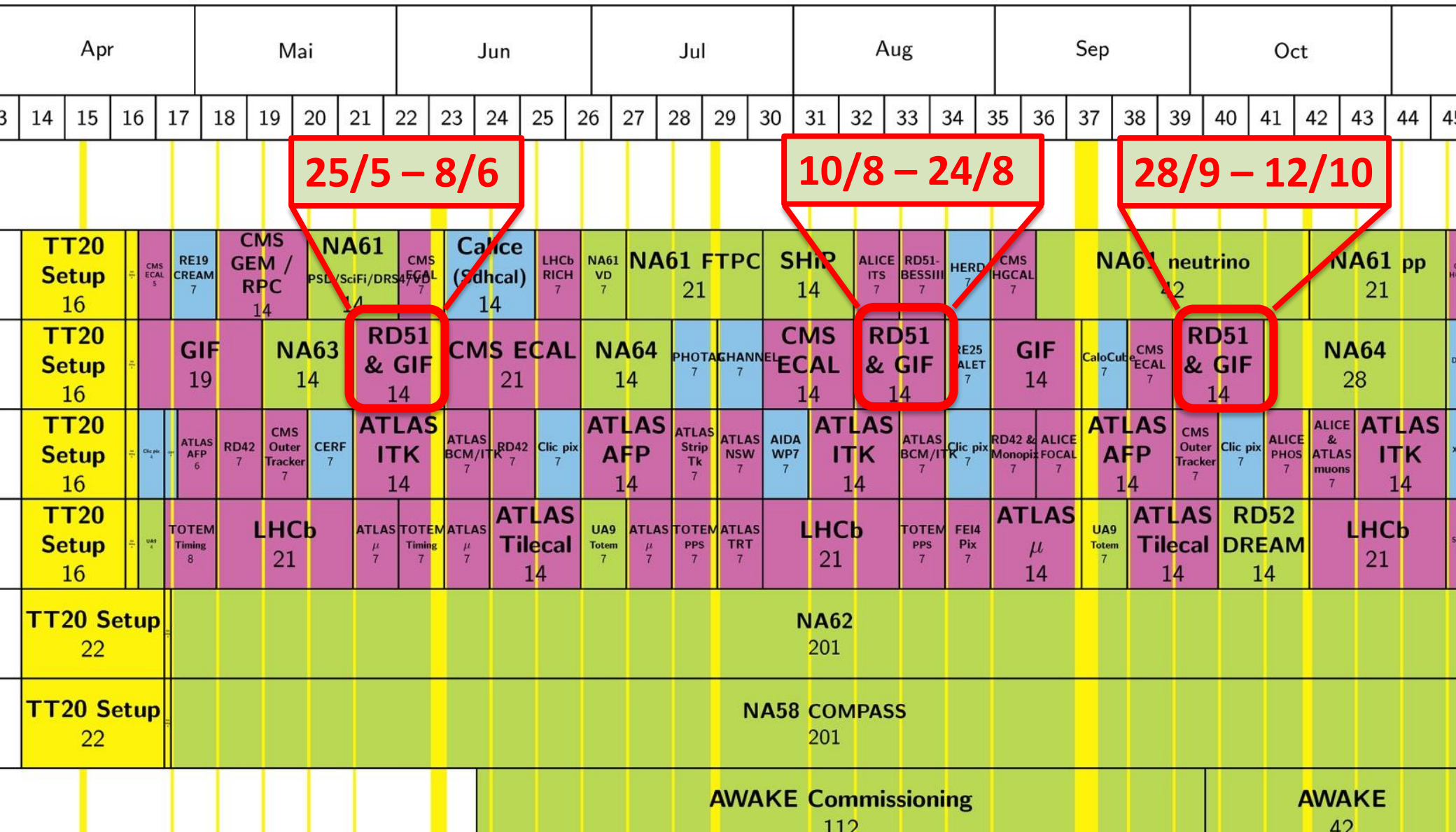
Yorgos Tsipolitis

SPS user schedule for 2016

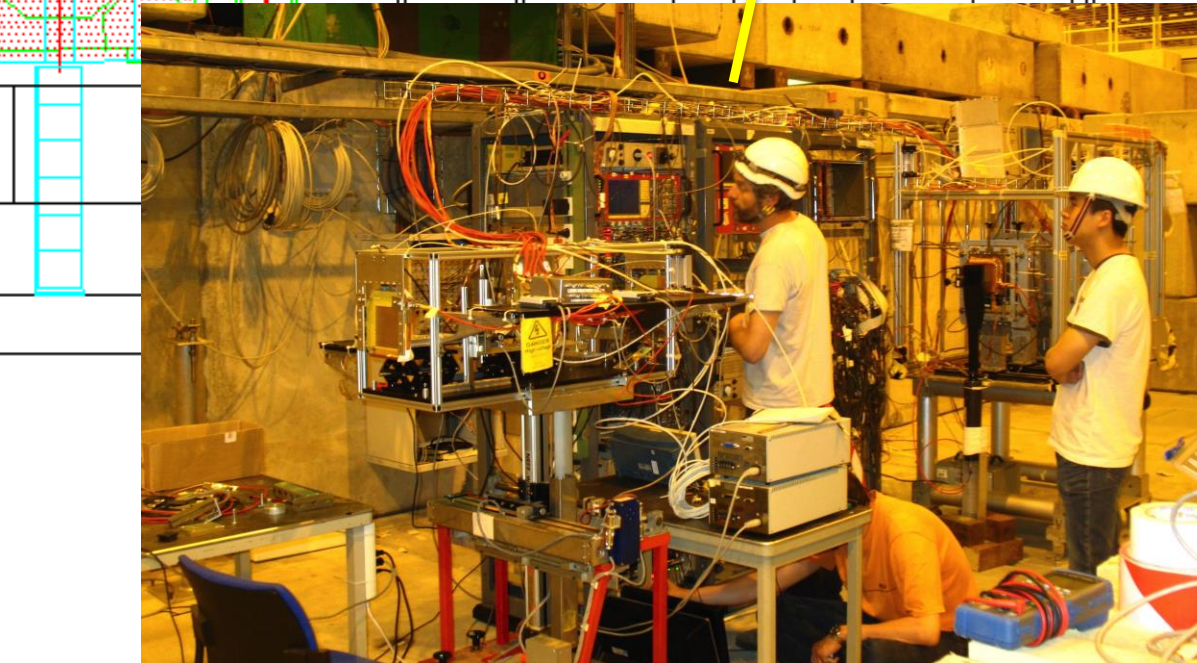
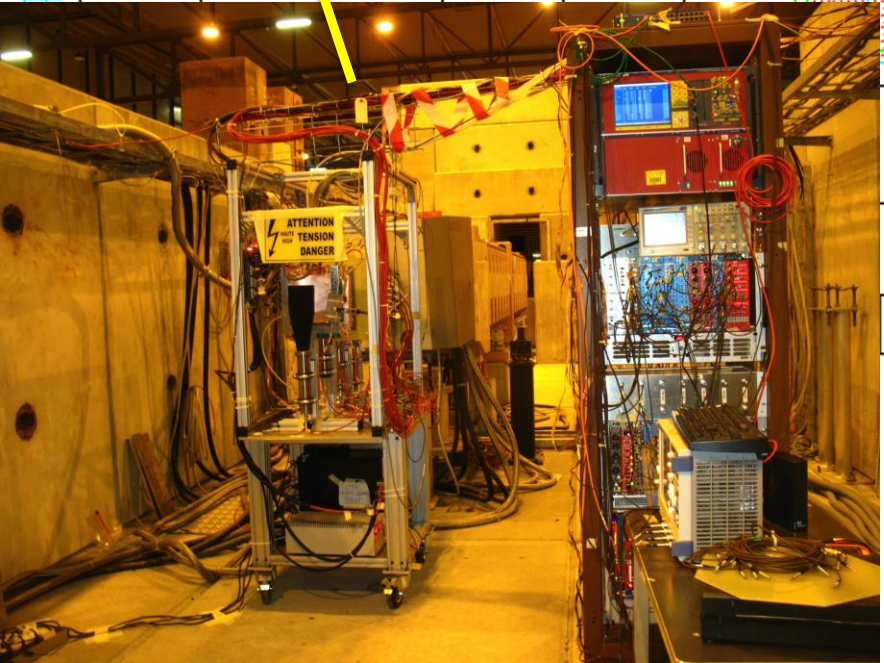
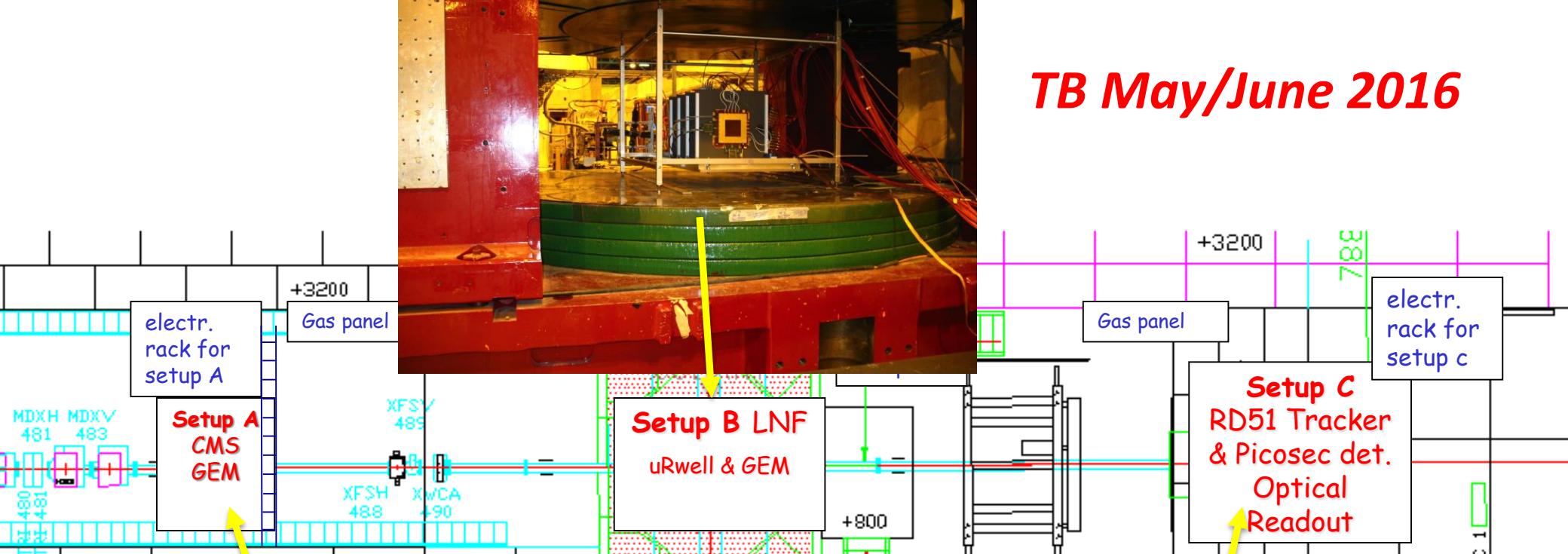
2016

Version: 2.2

LHC Exp.
 PS/SPS Exp.
 INT Exp.
 Other Exp.



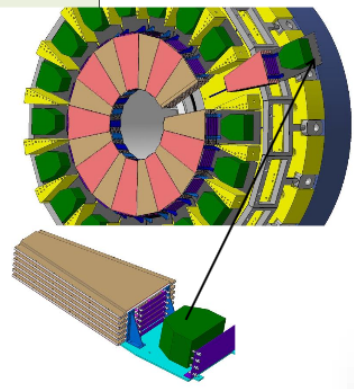
TB May/June 2016



CMS GEM Collaboration R&D

ME0 requirements and technical choices

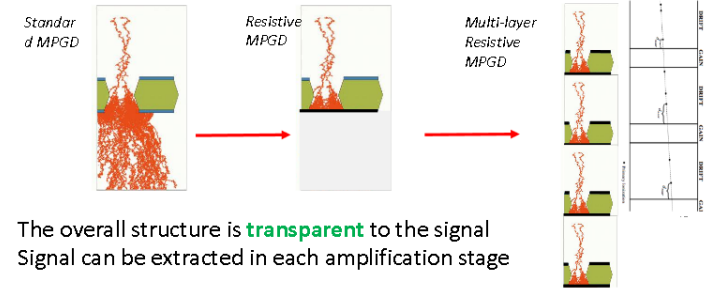
- Detector requirement:**
- Multilayer structures
 - High rate capability $O(\text{MHz}/\text{cm}^2)$
 - time resolution for triggering
 - No green house gases
 - Good spatial resolution $O(100 \mu\text{m})$ for tracking, triggering



- **Baseline :** Six layers of triple-GEM
- **Option :** Fast Timing Micropattern gas detector (FTM)

Sinem Salva, Ilaria Vai

ME0 Option: New generation of MPGD:FTM



The overall structure is **transparent** to the signal
Signal can be extracted in each amplification stage

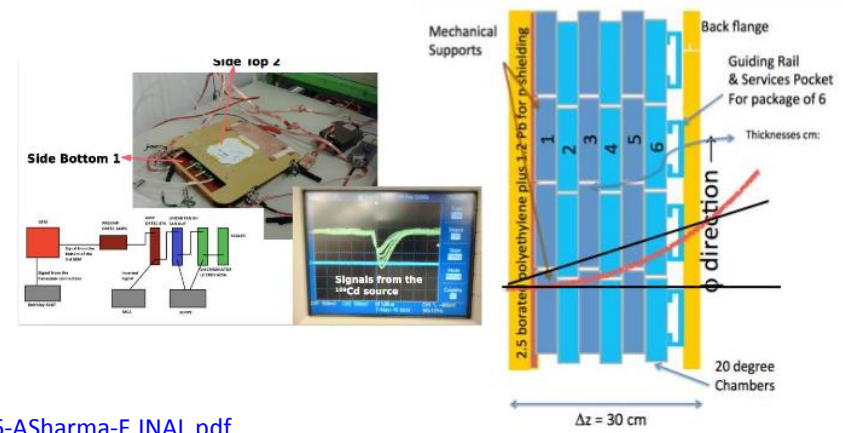
Time resolution a function of No. of layers
Beat the drift volume limitation !

Reference: [arXiv:1503.05330v1](https://arxiv.org/abs/1503.05330v1)
European Patent Application 14200153.6
M. Maggi, A. Sharma, R. De Oliveira

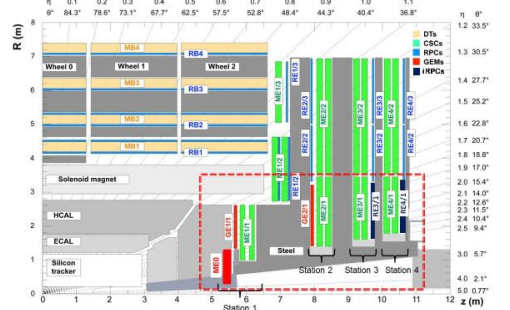
The very forward extension: ME0

Multi-layered structure to improve local muon track reconstruction, neutrons background rejection

ME0 baseline layout consists of 6 layers triple-GEM chambers



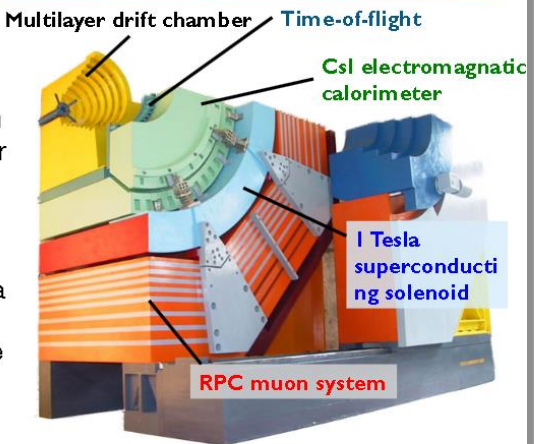
High η region upgrade with MPGD for Phase 2: ME0



- **Objectives:**
 - Sustain triggering at current trigger thresholds
 - Increase offline muon identification coverage
 - Maintain existing envelope by mitigating aging effects

The BESIII detector

- Multi-purpose magnetic spectrometer with 93% of 4π angular coverage.
- Our group is committed to data analysis and to hardware upgrade of the inner tracker.

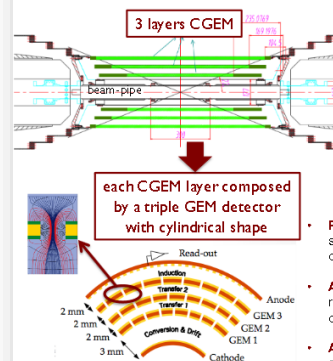


The KLOE-2 assembly technique

- A dedicated assembling machine has been designed and realized to perform the insertion of the electrodes.
- Axial alignment has a precision of 0.1mm/1.5m.
- The structure can rotate by 180° around its central horizontal axis.



Cylindrical GEM Inner Tracker



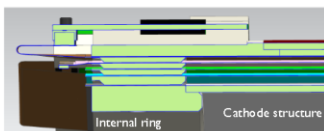
Detector requirements

- Rate capability: $\sim 10^4$ Hz/cm²
- Spatial resolution: $\sigma_{sp} \approx 130 \mu\text{m}$; $\sigma_z \approx 1 \text{ mm}$
- Momentum resolution: $\text{dP}/\text{P} \approx 0.5\%$ @ 1 GeV
- Efficiency $\approx 98\%$
- Material budget $\leq 1.5\%$ of X_0 for all layers
- Coverage: 93% 4π
- Operation duration ~ 5 years

Detector peculiarities and innovations

- Rohacell** will be used in the cathode and anode structure with a substantial reduction of the thickness of the detector.
- Analogue readout** to reach the required spatial resolution with a reasonable number of channels. A dedicated ASIC chip will be developed.
- Anode plane with jagged strips** to limit the parasitic capacitance

Detector mechanical design



The Ferrara group is responsible for the mechanical design of the detector, construction tooling and supporting structures.

<https://indico.cern.ch/event/365380/session/11/contribution/44/attachments/726469/996922/RD51-cibinetto-ferrara.pdf>

Very rich physics program: Charm, charmonium and exotic states spectroscopy, light hadrons, FF., τ physics. BESIII has the world largest J/ψ and $\psi(2S)$ dataset.

Picosecond

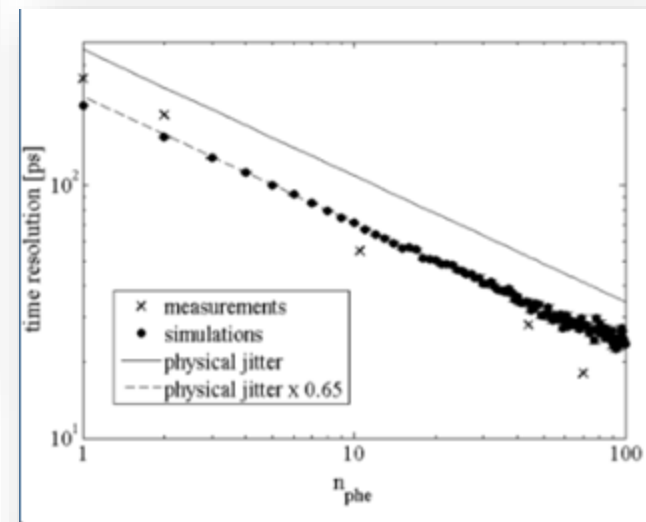
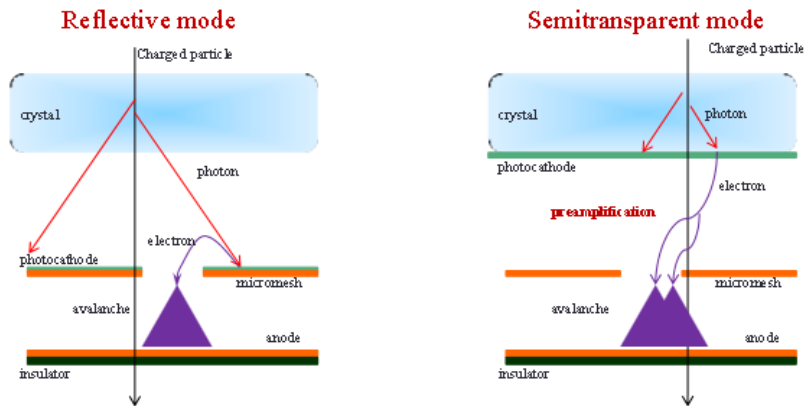
15th RD51 Collaboration Meeting
18 - 20 March 2015
CERN

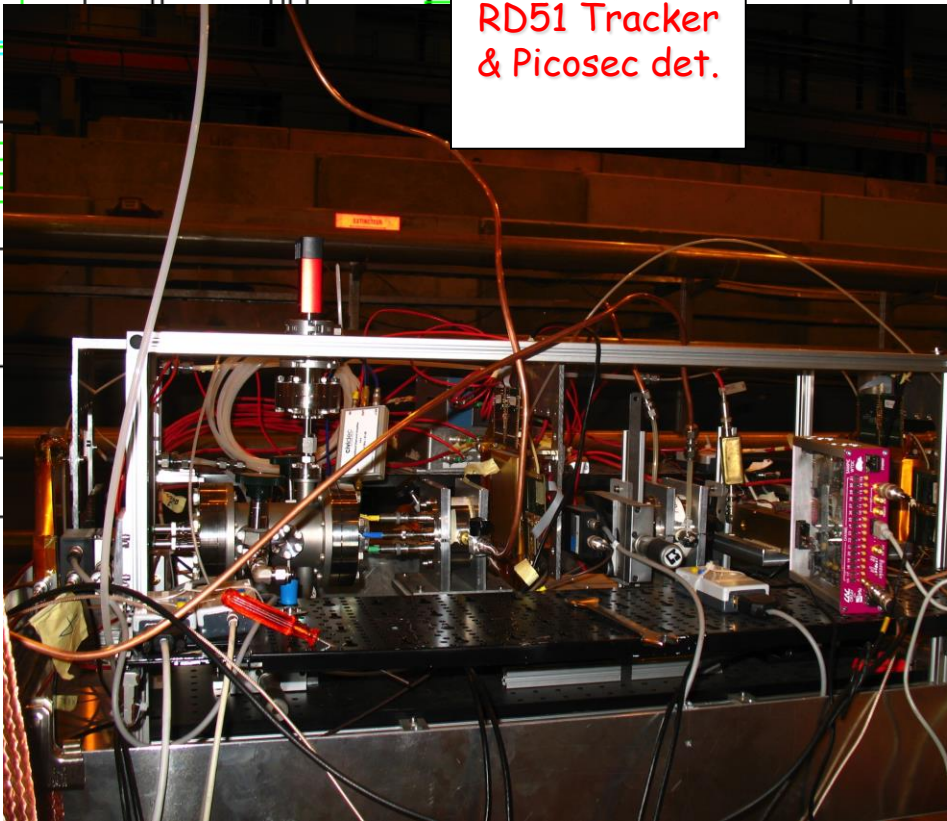
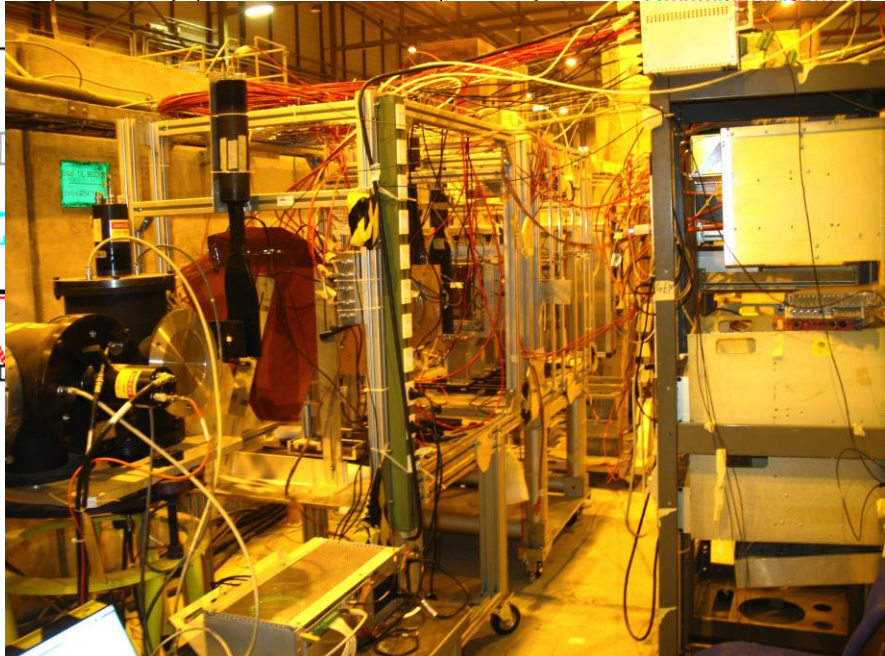
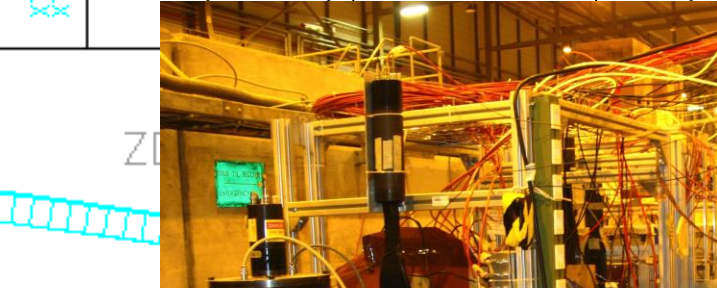
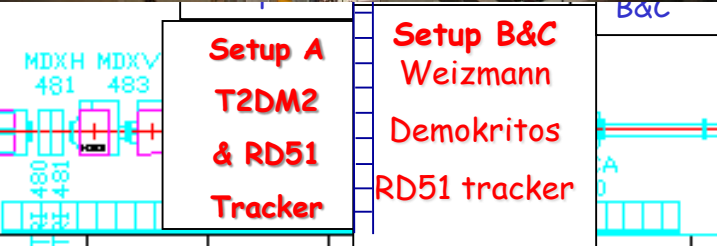
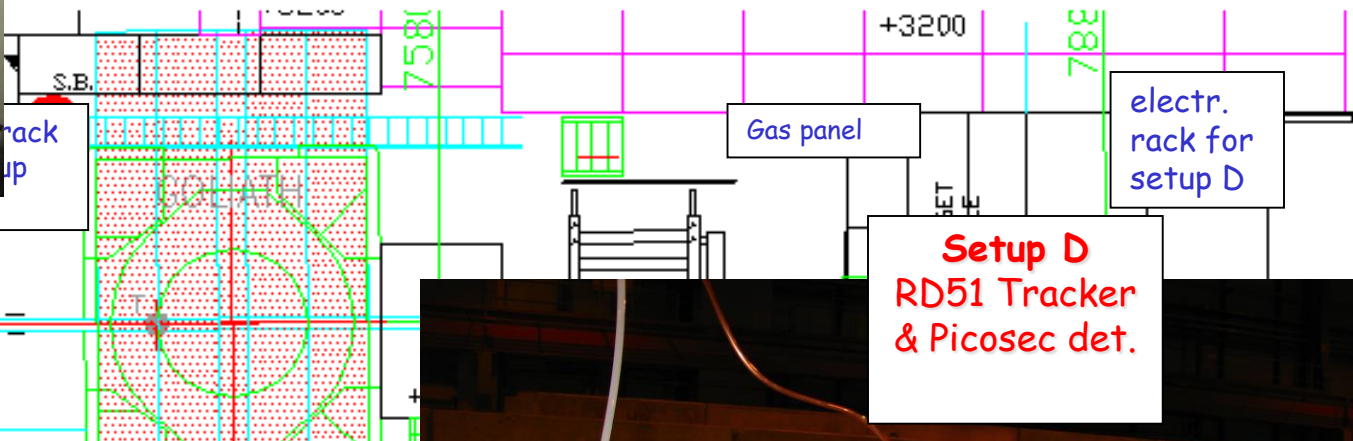
On the way to sub-100ps timing with Micromegas

T. Papaevangelou
IRFU / CEA Saclay

Primary ionization: photoelectrons

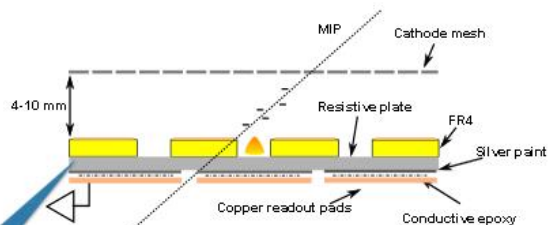
- Cherenkov light produced by charged particles crossing a MgF_2 crystal
- Photoelectrons extracted from a photocathode (CsI)
 - ➔ Simultaneous & well localized ionization of the gas



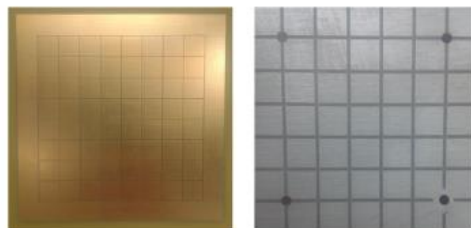


The RPWELL

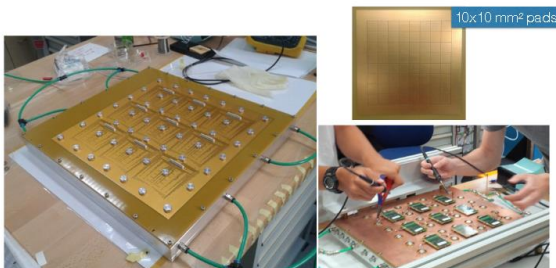
a single sided THGEM coupled to anode through a resistive plate
 (<http://iopscience.iop.org/1748-0221/8/11/P11004>)



0.4 mm Semitron ESD225 (bulk resistivity $10^8 \Omega\text{cm}$)



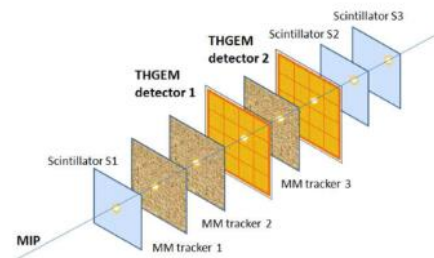
All the detectors are read by the SRS with APV25 chips



Readout: SRS with APV25 chips

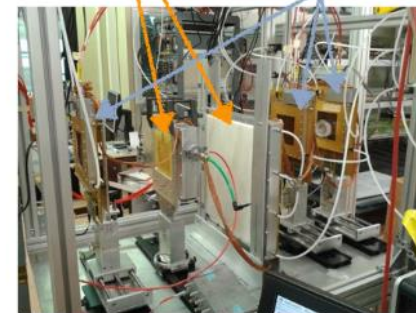
Weizmann et al.

Test beam setup



THGEM detectors

mm telescope



- RD51 mm telescope
 - 3 scintillators ($100 \times 100 \text{ mm}^2$ coverage)
 - 3 micromegas for precision tracking
- Two THGEM chambers
- Common DCS (HV control and monitoring)

T2DM2(LSBB)

https://indico.cern.ch/event/176664/session/1/contribution/21/attachments/229620/321251/CERN_RD51-WG5_20-22-2012.pdf

TOMOGRAPHY OF ROCK DENSITY VARYING IN TIME USING MUONS FLUX MEASUREMENTS (T2DM2)

(Tomographie densitométrique temporelle par mesure du flux de muons)

Collaborative Project



Stéphane GAFFET, Pierre SALIN*, Fanny HIVERT(Ph.D. student), José BUSTO*
OCA-Observatoire de la Côte d'azur - UMR GEOAZUR - UMR Artemis - UMS LSBB - *CPPM (Université de la Méditerranée)

COLLABORATION
CERN - CEA/IRFU- SHEFIELD UNIVERSITY - GÉOSCIENCES Montpellier - IPGP (Géophysique Spatiale et Planétaire), EMMAH (Université d'Avignon et des Pays de Vaucluse) - *APC (Astroparticules et Cosmologie Université Paris7) - CFM (Lisbonne)

INTERDISCIPLINARITY
ASTROPARTICULES - SEISMIC IMAGERY - GRAVIMETRIC - HYDRO GEOLOGY - ROCK MECHANICS - EM IMAGERY

*On behalf of the T2DM2 collaboration

RD51

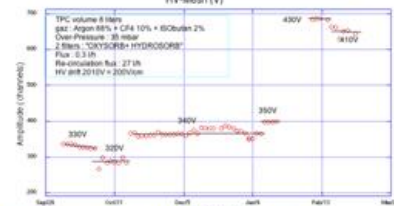
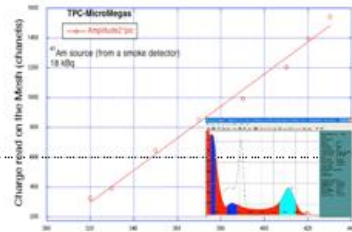
26-27 April 2012, Anecy-le-Vieux, France

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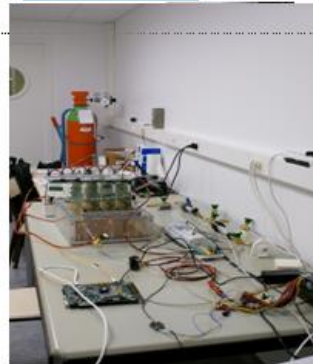
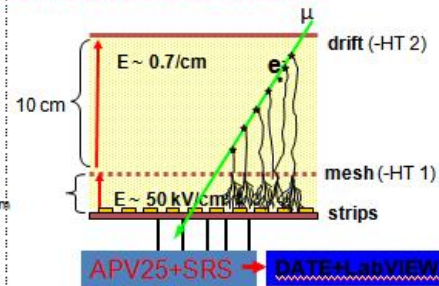
DESIGN OF TELESCOPE AND TECHNOLOGY CHOICES

Micromegas-Bulk in TPC mode

- Combine triggering and readout functions
- Spatial resolution ~ 100 μm ($\theta_{\text{max}} < 45^\circ$)
- Good double track resolution
- Time resolution ~ 5 ns
- Efficiency > 98%
- Rate capability > 5 hits/cm²
- Potential for going to large areas (1 x 2 m² with industrial processes)
- Cost effective



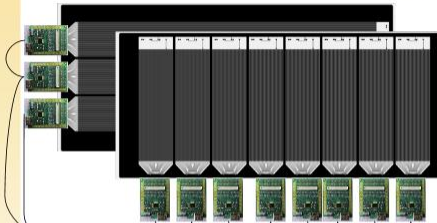
« Micromegas in a bulk » NIMA 560 (2006) 405-408



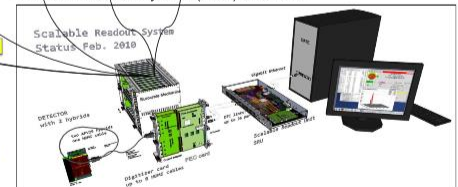
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ELECTRONIC & DAQ

SLC-5.7
DATE
LabView
SDC



Small problems with the ungrounded SRS crate. I will use isolation transformer with double electrostatic screen and case grounded (noisy ground)

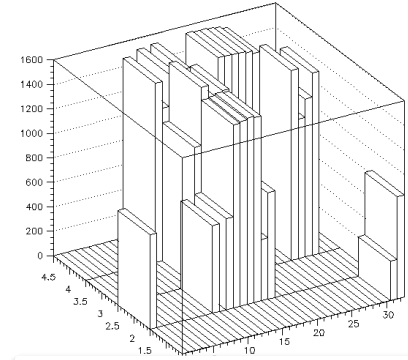


ASIC board with spark protections connected to detector → Digitizer card (ADC) = Front-end concentrator card → Scalable Readout Unit For multiplexing of event data → PC with slow control soft. + analysis framework

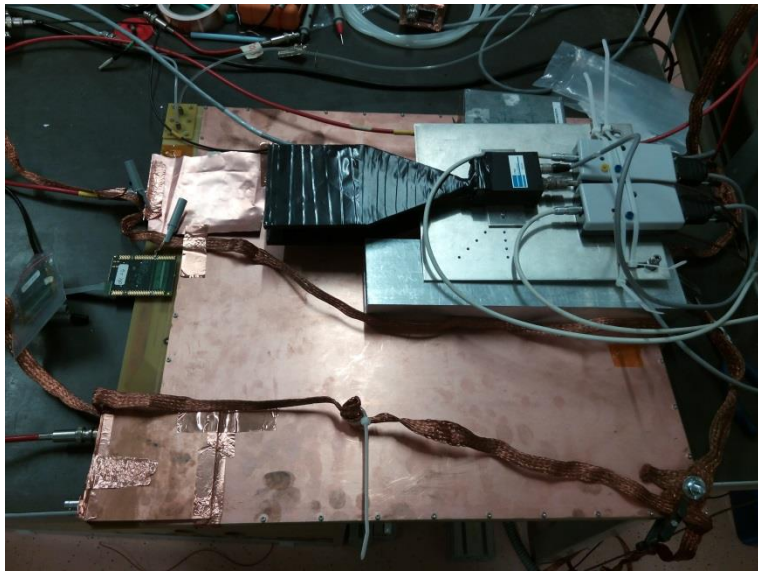
APV25 and Self-Triggering (Mesh) micromegas

50x50 cm² MICROMEGAS for Shower Detection

4 columns of 32 pads each
1.5 x 12.5 cm² per pad

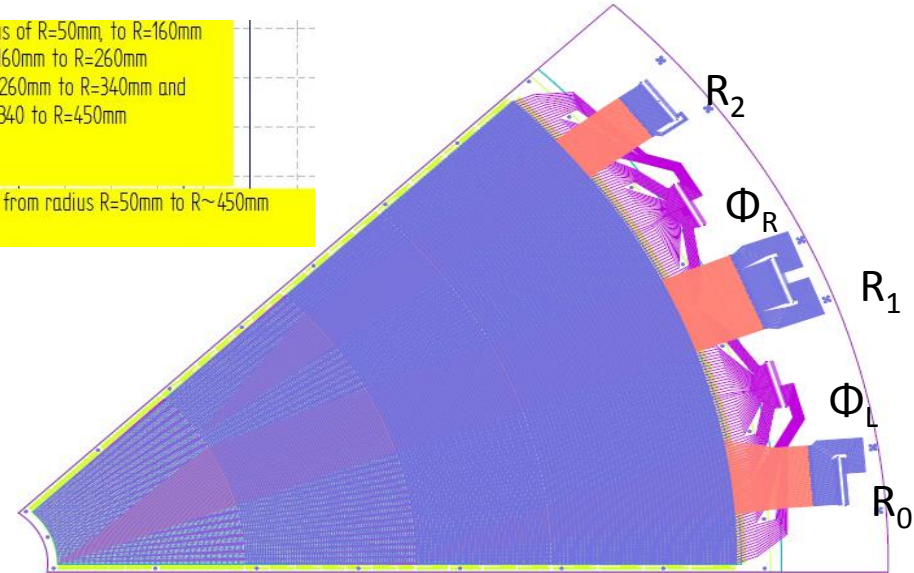


A Shower Event



rings ~1mm pitch, from radius of R=50mm, to R=160mm
~15mm pitch, from R=160mm to R=260mm
~20mm pitch, from R=260mm to R=340mm and
~25mm pitch from R=340 to R=450mm
250 rings per octant

phi strips ~0.25 degrees pitch from radius R=50mm to R~450mm
180 phi strips per octant



**R- ϕ Micromegas
octant – segmentation and connectors**

2 octants, to be integrated to two
TPC detectors (e.g. used as polarimeters)



Sept/Oct TB

- BES III (in the magnet)
- Micromegas pad
- Demokritos
- Picosec
- ~~ATLAS NSW (in the magnet)~~ } **CANCELED**
- ~~ALICE TPC~~
- With GIF++ we have found a working point but it strongly depends on the use of GOLIATH

Next Year

- We plan to ask again 3 periods of 2 weeks
- We will ask the SPS coordinator to give us at least 1 period without sharing (fall 2017 ?)