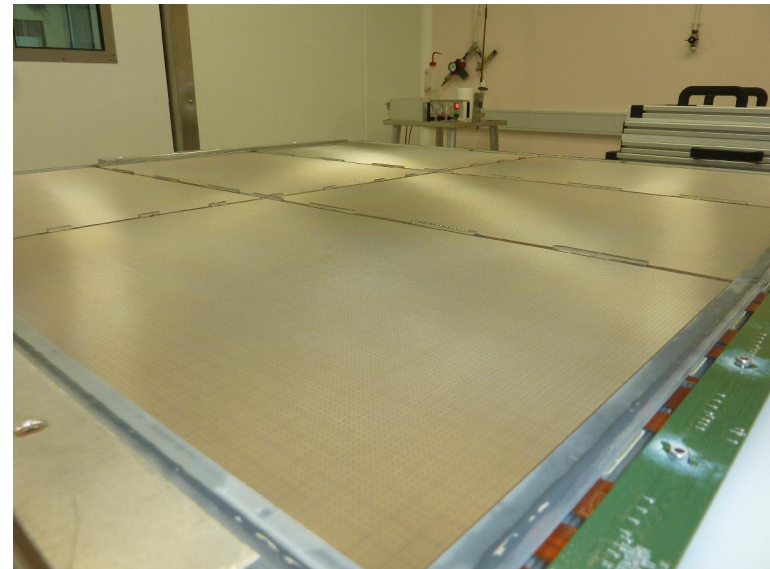


# Micromegas SDHAL

## TB status and plans

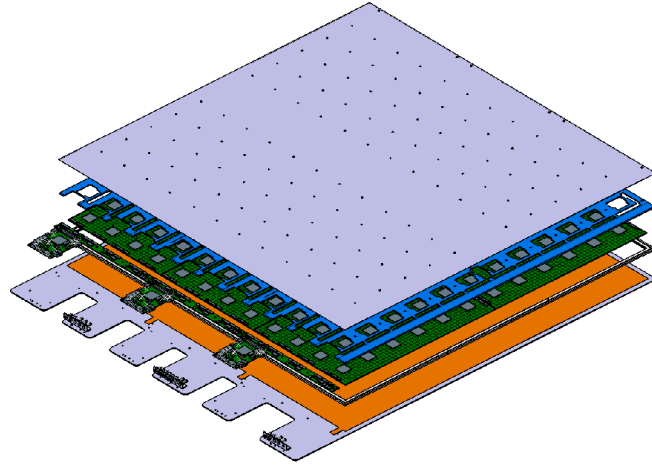
RD51/WG7 mini-week  
21-23 Nov. 2011, CERN  
M. Chefdeville, LAPP, Annecy

- Status
  - Detectors
  - Characterisation
- Plans
  - Next prototypes
  - Test Beams

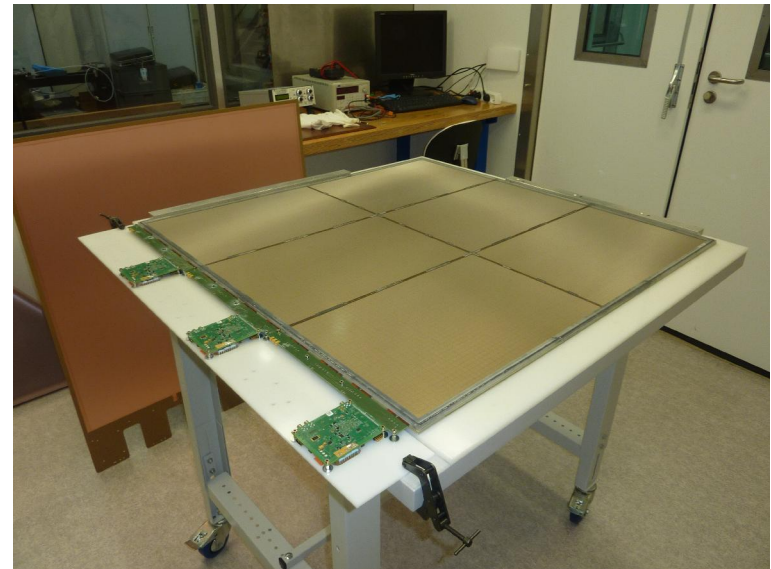


# 1 m<sup>2</sup> prototype tested in 2011

- Reminder on 2010 prototype
  - HARDROC2 ASIC: 20 ns shaping
  - 5 Bulk of 32x48 cm<sup>2</sup>
    - pads of 1 cm<sup>2</sup>
    - Thickness of 12 mm



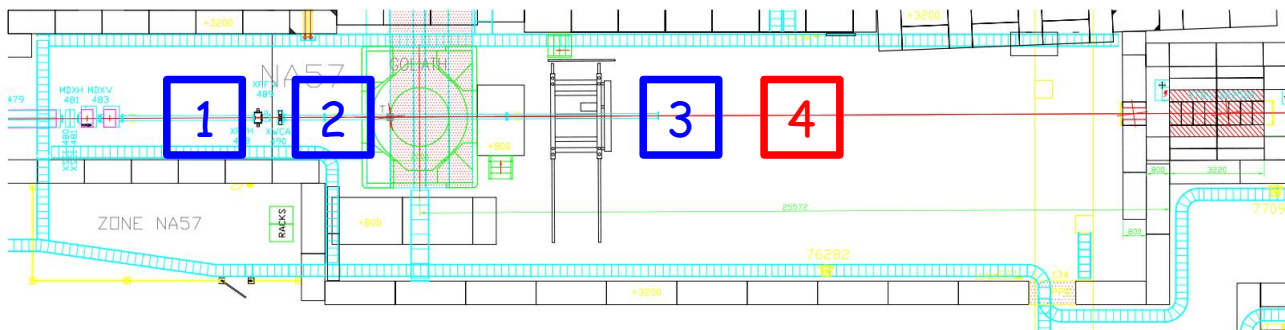
- 2011 prototype
  - **MICROROC: 50-200 ns shaping**
  - **6 Bulk: 96x96 = 9216 pads**
    - Dead area < 2 %
  - **Improved PCB**
    - Better EMC to minimize X-talk
    - Possibility to by-pass single chips
    - Improved spark protections
    - Digital + Analogue readout
  - **Improved mechanics: thickness of 10 mm**
    - Thinner mask 3 to 2 mm
    - Gas tightness between ASU & cathode
      - Removable 1 mm thick chamber cover



# August 2011 test beam

- After test at LAPP,  
good understanding of the detector
  - Noise level under control,  
successful RAMFULL runs
  - $^{55}\text{Fe}$  and cosmic signals seen
  - 3 thresholds under control
- Ready for beam
- SPS/H4 3-22 August
  - 6 days standalone CALICE
  - 13 days multi-users RD51  
4 set-ups

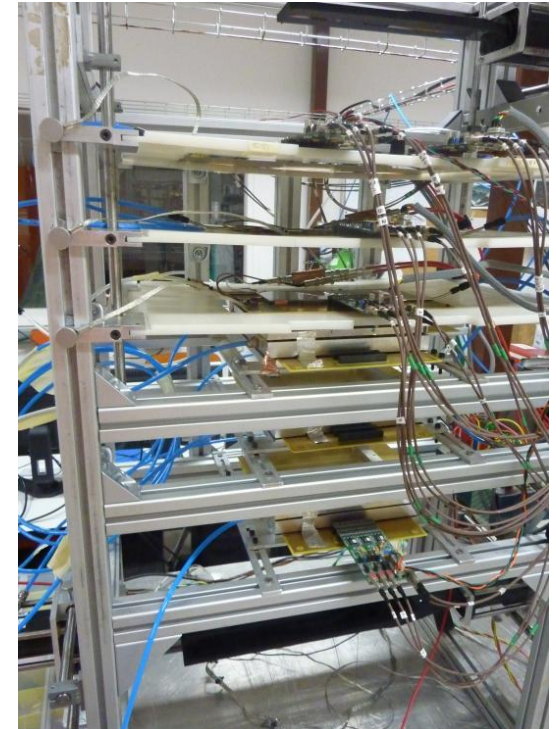
- **Measurements with muons (150 GeV/c)**
  - Define working point of detector  
(voltage, shaping & threshold scans)
  - Measure efficiency, multiplicity,  
uniformity (2/3 of area)
  - Demonstrate RAMFULL operation  
in beam conditions
  - Measure multiplicity  
at various beam incidence angle
- **Measurements with pions (150 GeV/c)**
  - Landau distribution with analogue  
readout of low gain shaper
  - Shower signals with 3 thresholds
  - Validate spark protection by operation at  
(too) high gas gain



Long list of goals...

# Setup (I)

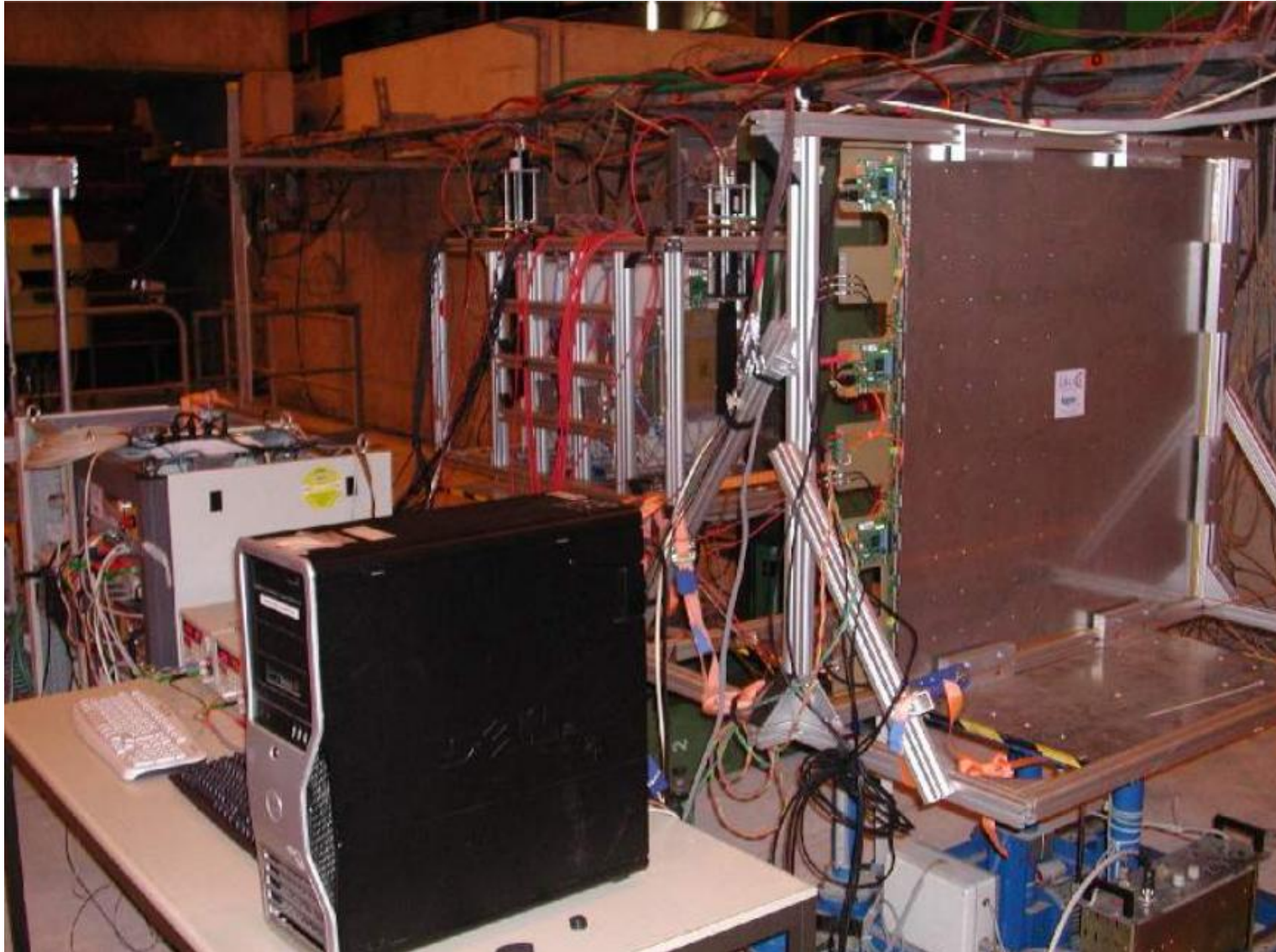
- Trigger: 3 scintillators, overlap area of  $6 \times 16 \text{ cm}^2$
- Tracking
  - Pad telescope of LAPP (Gassiplex)
    - 3 chambers of  $6 \times 16$  pads of  $1 \text{ cm}^2$
    - 3 mm drift gap
  - Strip telescope of NCSR Demokritos, NTUA (Gassiplex) (RD51 Micromegas telescope)
    - 6 chambers with 10 cm XY strips of  $250 \mu\text{m}$  pitch
    - active area of  $2.4 \times 2.4 \text{ cm}^2$
    - 7 mm drift gap
  - DAQ: VME ADC + Sequencer and CENTAURE DAQ
- 1 m<sup>2</sup> prototype with 144 Microroc
  - DAQ: (interDIF + DIF + CCC) and LAPP LabView DAQ
  - New gas: Ar/CF<sub>4</sub>/iso 95/3/2, so-called "T2K gas"
- Hardware Synchronization telescopes/prototype with busy handshake between VME sequencer and CCC



Non-flammable gas!



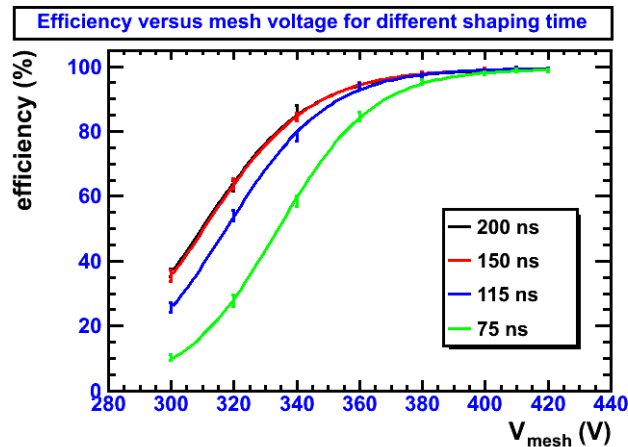
# Setup (II)



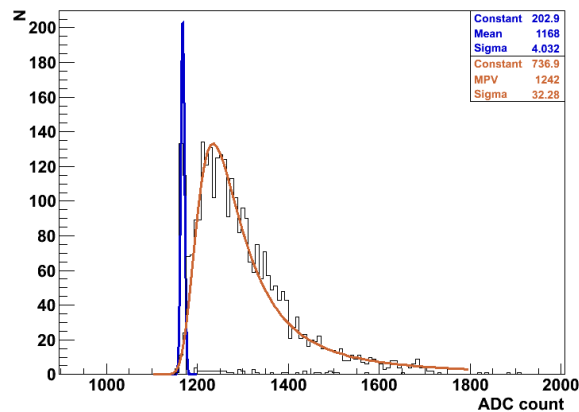
# Some preliminary results

- During 18 days: about 6 Mevents
  - 85 % of muons
  - 15 % of pions

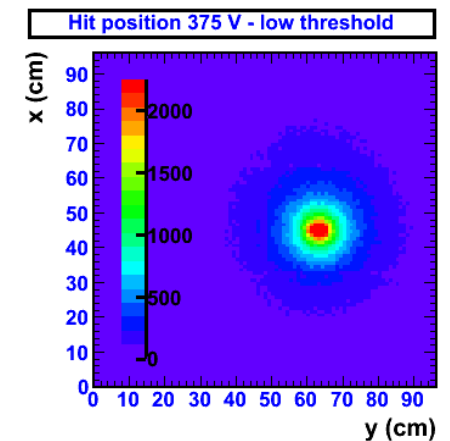
## Mesh voltage scan - muons



## Analogue readout - pions



## Showers - pions+iron

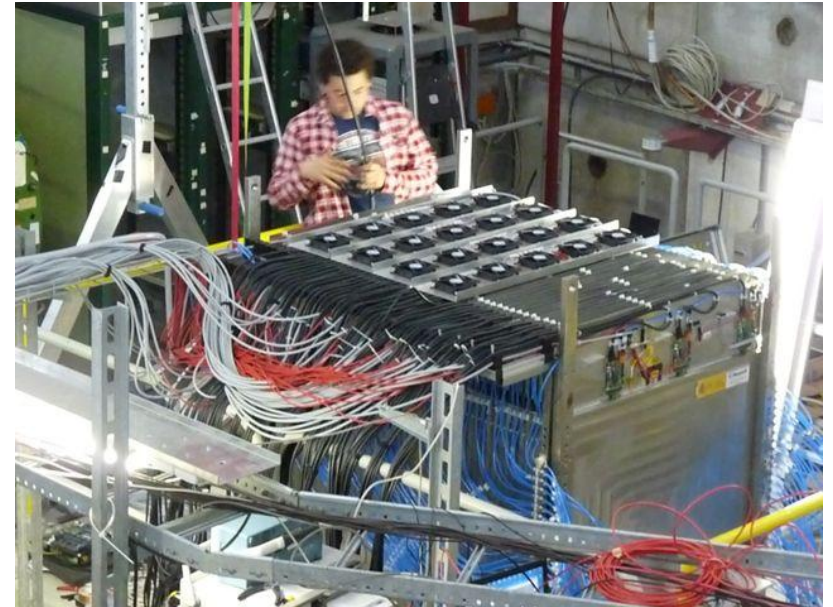


→ Working settings  
200 ns shaping, 0.7 fC threshold,  $V_{\text{mesh}} = 390\text{V}$ ,  $\text{Gain} = 3000$ ,  $V_{\text{drift}} = 480\text{V}$   
efficiency = 98 %, multiplicity = 1.1, noise rate = 0.1 Hz/channel

More details in WG1 session

# October 2011 test beam

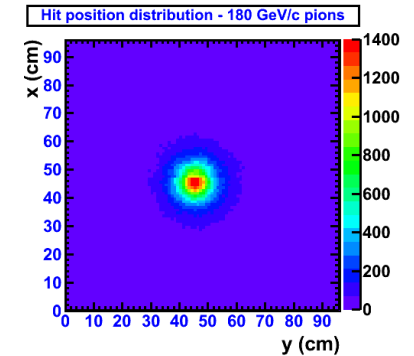
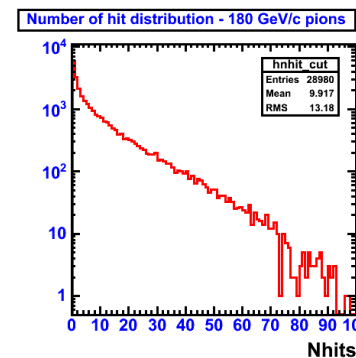
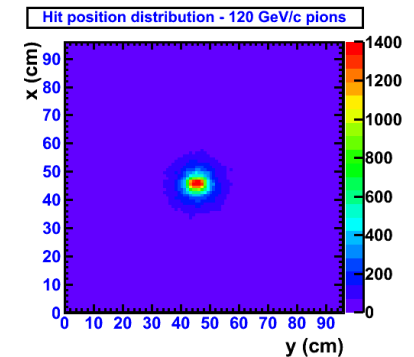
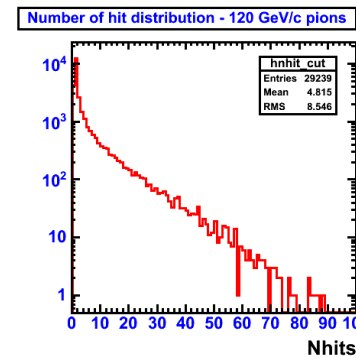
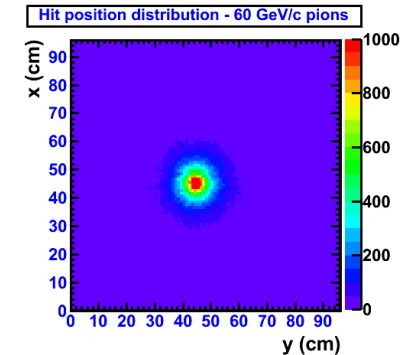
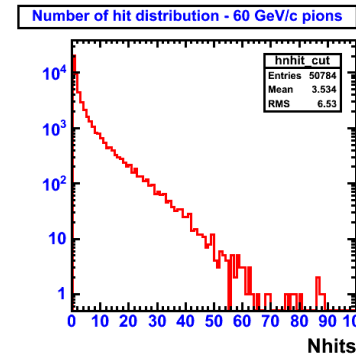
- Join CALICE test beam in H8
  - 3-12 October
  - GRPC/steel DHCAL
  - Occupy slot 47 (~ 5 interaction length)
- **Goals**
  - Validate prototype operating point in showers
  - Measure shower profiles using GRPC data
- Unfortunately CALICE DAQ very unstable  
→ Data taking in standalone
- **Collected data: about 1 Mevents**
  - 80 GeV/c pions ~ 50k evts
  - 60 GeV/c pions ~ 600k evts
  - 100 GeV/c pions ~ 130k evts
  - 120 GeV/c pions ~ 120k evts
  - 150 GeV/c pions ~ 70k evts
  - 180 GeV/c pions ~ 60k evts



12 mm gaps!

# October 2011 test beam

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  - 3-12 October
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# Future plans

- Next m<sup>2</sup> prototypes:
  - 2<sup>nd</sup> MICROROC constructed in October 2011
    - \_ Begin tested at LAPP (Readout, HT, gas, noise, cosmics)
  - New batch of chips available beginning of next year
    - construction of 1 to 3 prototypes
    - at least 1 with resistive coatings (ANR SPLAM)
- 2012 TB goals
  - RD51: Comparison resistive/standard prototypes
    - \_ Efficiency & multiplicity to MIPs, position scan → 1 week
    - \_ Effect of sparks (pions), beam rate & HV scans → 1 week
    - 2 weeks at the end of the year
  - CALICE: test of all available planes inside structure (Fe or W)
    - \_ Join physics run of a complete HCAL → No beam privileges
    - \_ DAQ not ready yet → Uncertain at this moment
    - Beam schedule will depend on state of CALICE DAQ