

# Micromegas DHCAL 2010 TB plans

RD51 collaboration meeting  
C. ADLOFF/M.CHEFDEVILLE, LAPP, Annecy  
Freiburg, May. 25<sup>th</sup> 2010

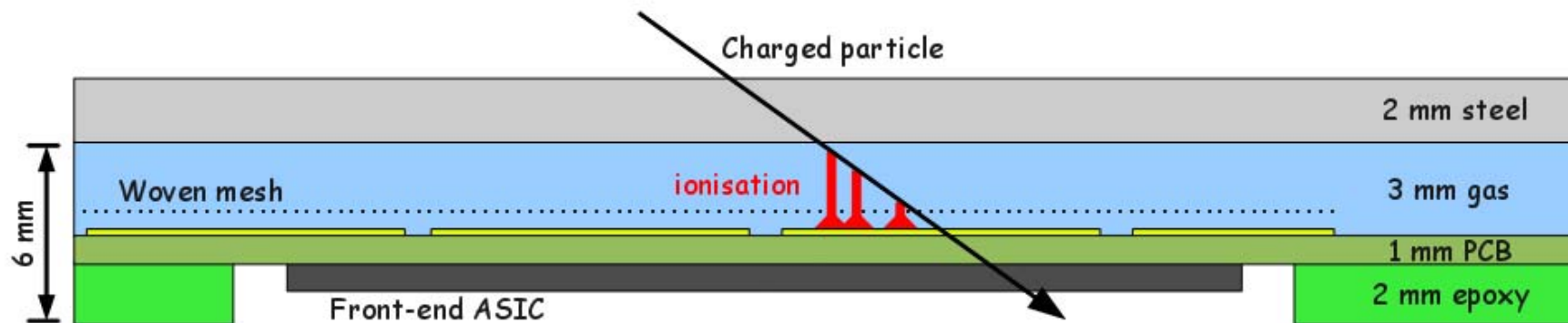
# Outline

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- Detectors
- Past
- Future
- TB request for 2010

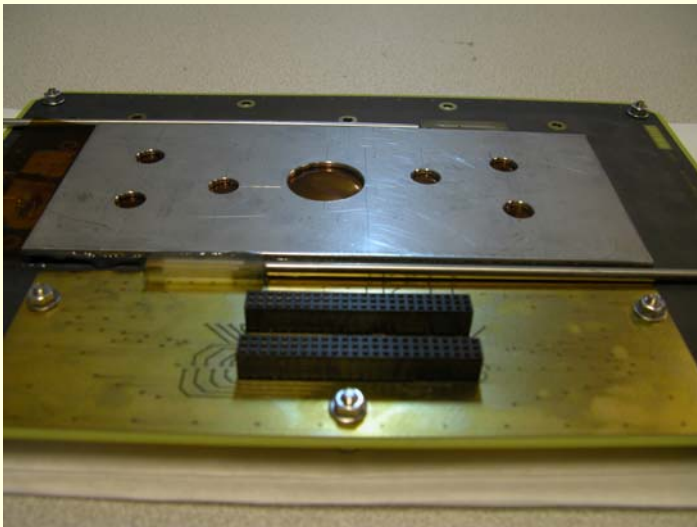
# Micromegas for a DHCAL

- Bulk-Micromegas
- 1 cm<sup>2</sup> **semi**-digital readout pads (1 or **2** bits)
- Embedded front-end ASICs
- Active medium thickness : 6 mm  
3 mm gas, 3 mm PCB/epoxy
- Part of the Micromegas chamber is the absorber

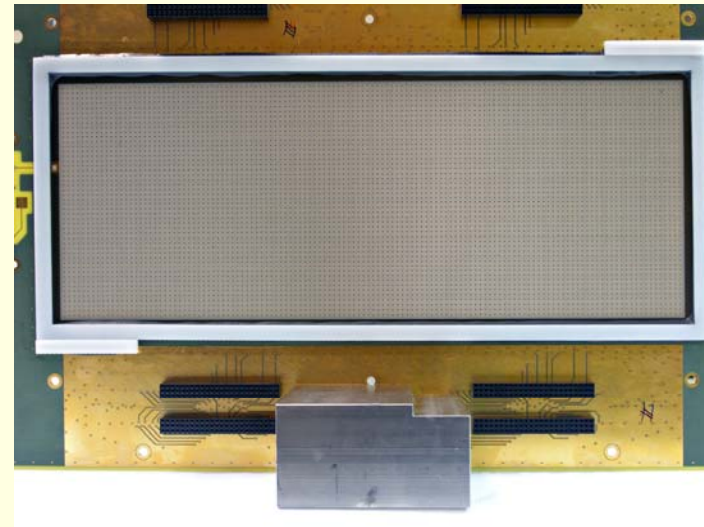


# Micromegas prototypes (I)

- **1<sup>st</sup> prototypes: 6x16 cm<sup>2</sup> & 12x32 cm<sup>2</sup> with analog readout (GASSIPLEX)**
- **2<sup>nd</sup> prototypes: 8x8 cm<sup>2</sup> & 8x32 cm<sup>2</sup> with embedded digital chips (DIRAC/HARDROC)**
- **3<sup>rd</sup> prototypes: 32x48 cm<sup>2</sup>**
- **4<sup>th</sup> prototype: 1 m<sup>2</sup>**



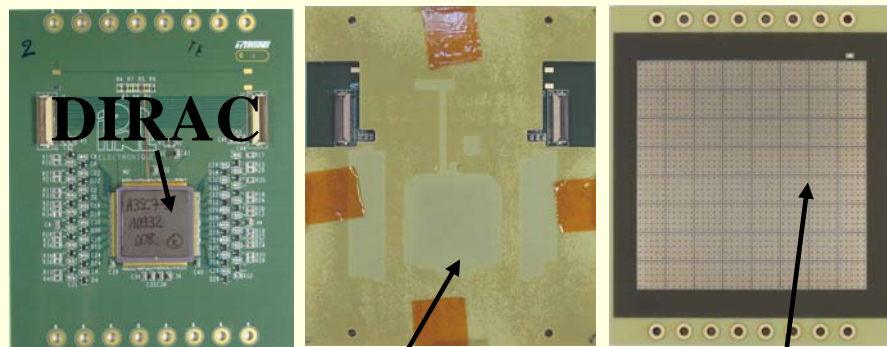
*6x16 cm<sup>2</sup> chamber*



*12x32 cm<sup>2</sup> chamber*

# Micromegas prototypes (II)

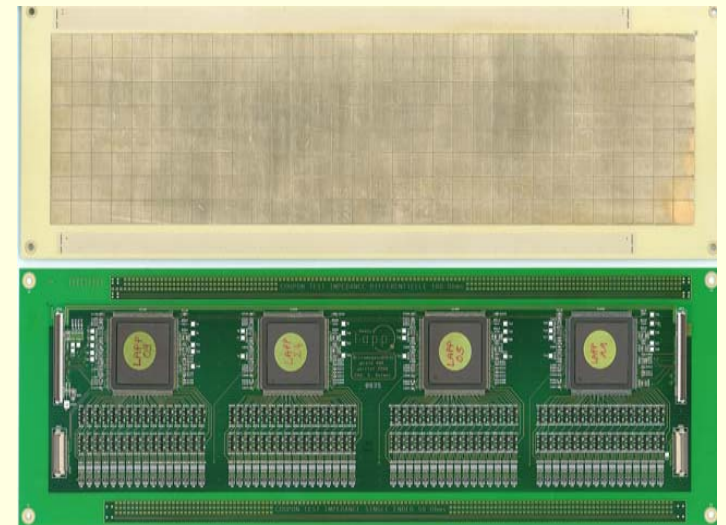
- 1<sup>st</sup> prototypes: 6x16 cm<sup>2</sup> & 12x32 cm<sup>2</sup> with analog readout (GASSIPLEX)
- **2<sup>nd</sup> prototypes: 8x8 cm<sup>2</sup> & 8x32 cm<sup>2</sup> with embedded digital chips (DIRAC1/HARDROC1)**
- 3<sup>rd</sup> prototypes: 32x48 cm<sup>2</sup>
- 4<sup>th</sup> prototype: 1 m<sup>2</sup>



mask for bulk layering

8x8 pads with bulk

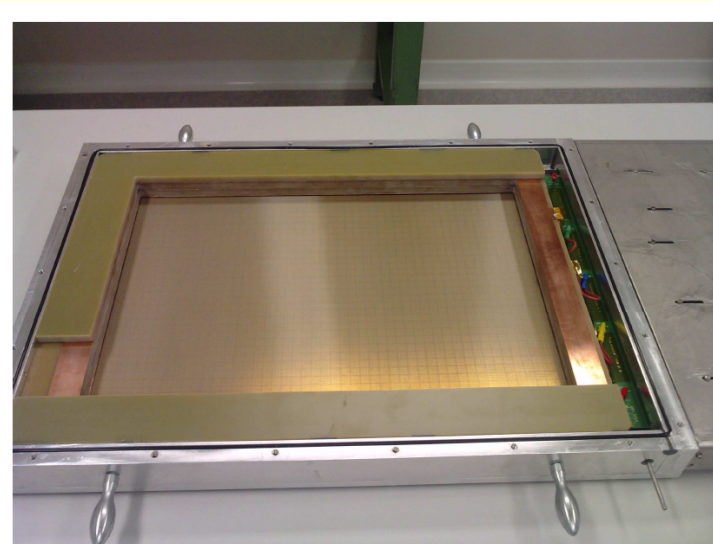
*First MICROMEAS with  
embedded ASIC:  
8x8 cm<sup>2</sup> bulk with 1 DIRAC1*



*8x32 cm<sup>2</sup> bulk with  
4 HARDROC1*

# Micromegas prototypes (III)

- 1<sup>st</sup> prototypes: 6x16 cm<sup>2</sup> & 12x32 cm<sup>2</sup>  
with analog readout (GASSIPLEX)
- 2<sup>nd</sup> prototypes: 8x8 cm<sup>2</sup> & 8x32 cm<sup>2</sup>  
with embedded digital chips (DIRAC1/HARDROC1)
- **3<sup>rd</sup> prototypes: 32x48 cm<sup>2</sup> (HARDROC2)**
- 4<sup>th</sup> prototype: 1 m<sup>2</sup>



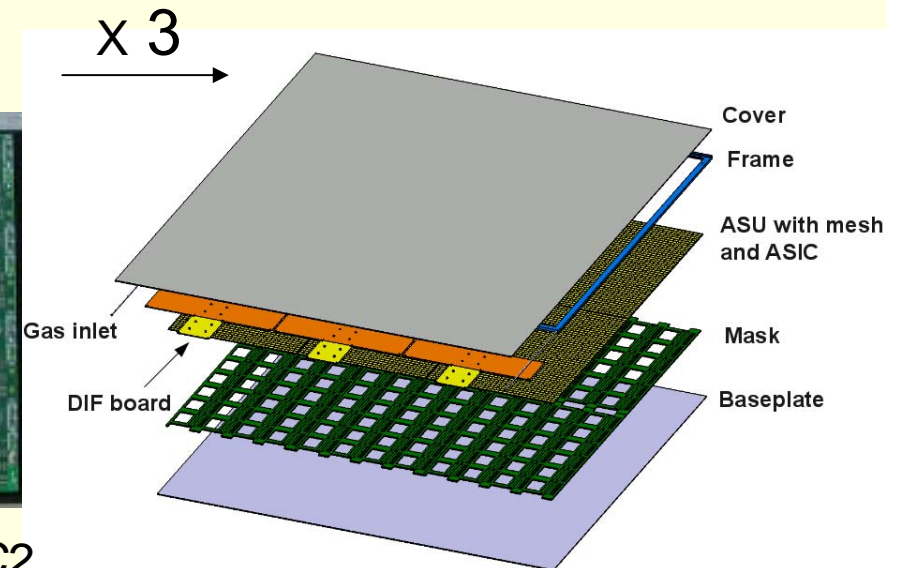
*32x48 cm<sup>2</sup> bulk with 24 HARDROC2 : Active Sensor Unit (ASU)*

# Micromegas prototypes (IV)

- 1<sup>st</sup> prototypes: 6x16 cm<sup>2</sup> & 12x32 cm<sup>2</sup> with analog readout (GASSIPLEX)
- 2<sup>nd</sup> prototypes: 8x8 cm<sup>2</sup> & 8x32 cm<sup>2</sup> with embedded digital chips (DIRAC/HARDROC)
- 3<sup>rd</sup> prototypes: 32x48 cm<sup>2</sup>
- **4<sup>th</sup> prototype: 1 m<sup>2</sup>**



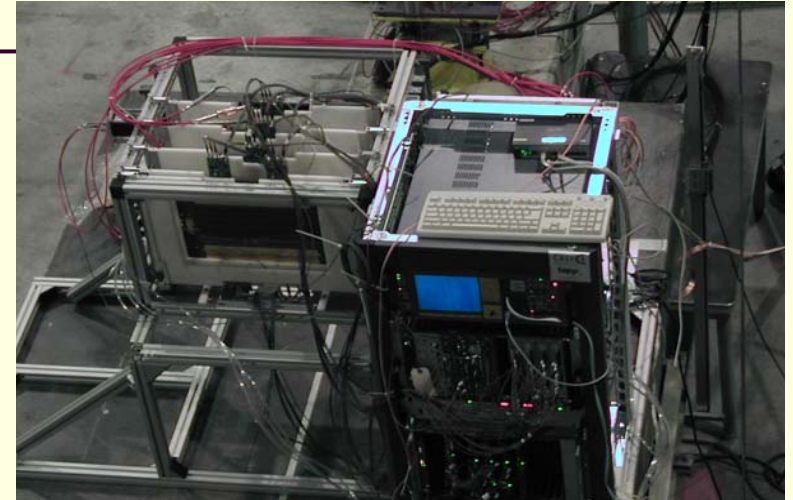
2 chained ASU of 32x48 cm<sup>2</sup> bulk with 24 HARDROC2



see M. Chefdeville talk this afternoon

# Past beam tests (I)

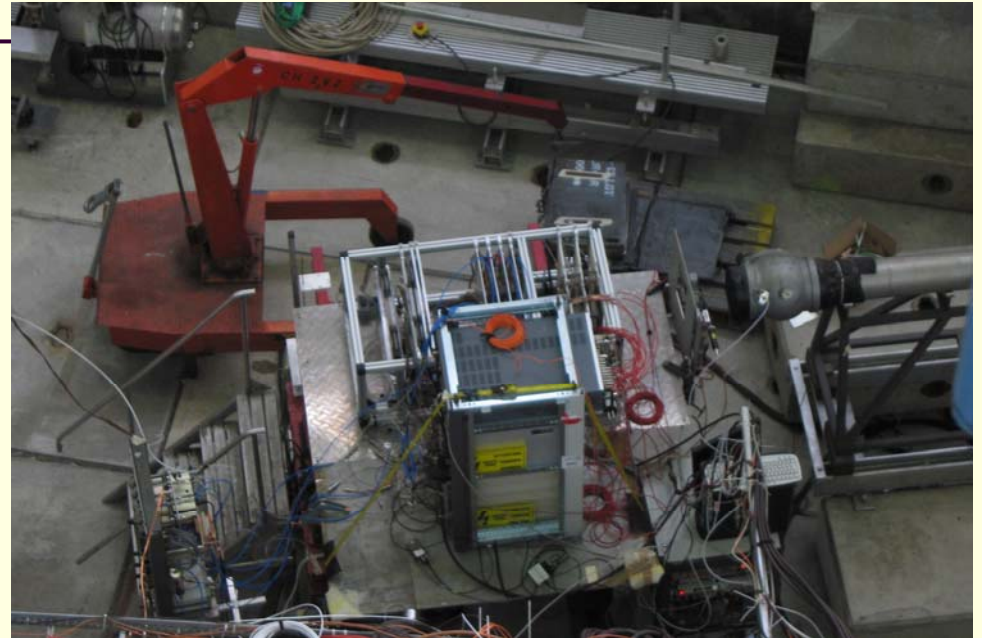
- **August 08 @ SPS**  
test of analog prototypes  
with help from Irfu  
Test of digital prototypes  
(DIRAC1)
- → **2009 JINST 4 P11023**
- **November 08 @ PS**  
test of digital prototypes  
(HARDROC1)
- **May/June 09 @ PS**
- **November 09 @ PS**





# Past beam tests (II)

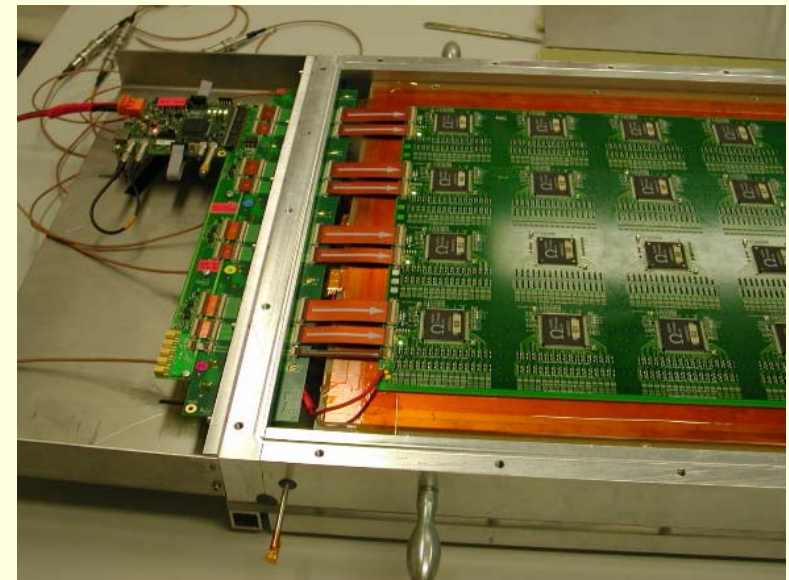
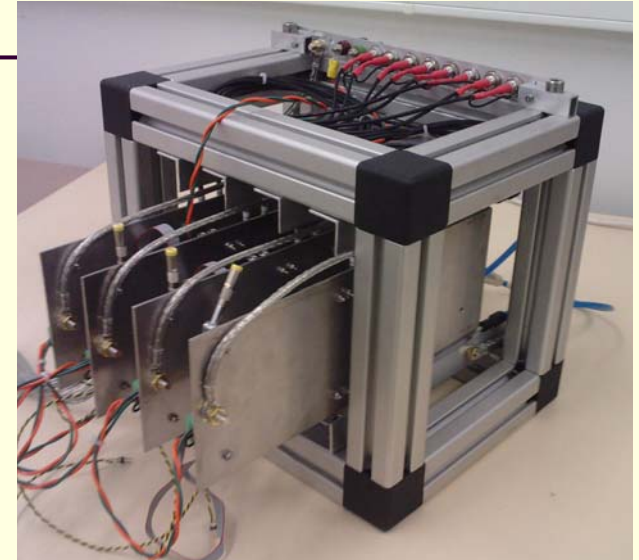
- August 08 @ SPS
- November 08 @ PS
- **May/June 09 @ PS**  
**Test of analog prototypes**  
**in electron showers**  
**Test of digital prototypes**  
**with HARDROC1 chips**  
**→ 2010 JINST 5 P01013**
- November 09 @ PS



# Past beam tests (III)

- August 08 @ SPS
- November 08 @ PS
- May/June 09 @ PS
- **November 09 @ PS**  
**Test of analog prototypes**  
**in hadron showers**  
**Test of digital prototypes**  
**8x8 cm<sup>2</sup> DIRAC2 chips**  
**and**  
**32x48 cm<sup>2</sup> HARDROC2**

*8x8 cm<sup>2</sup>  
DIRAC2*



*32x48 cm<sup>2</sup> HARDROC2*

# LAPP beam tests periods in 2010

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- 2 weeks on H4 from 10<sup>th</sup> June  
request done through CALICE  
from 21<sup>st</sup> RD51 users as guests!
- 2 week on H4 from 24<sup>rd</sup>  
request done through RD51  
beam time shared with other RD51 groups
- Part of the CALICE/W-HCAL beam request  
2 weeks in November on PS  
→ test of m<sup>2</sup> prototype in W-structure (showers)

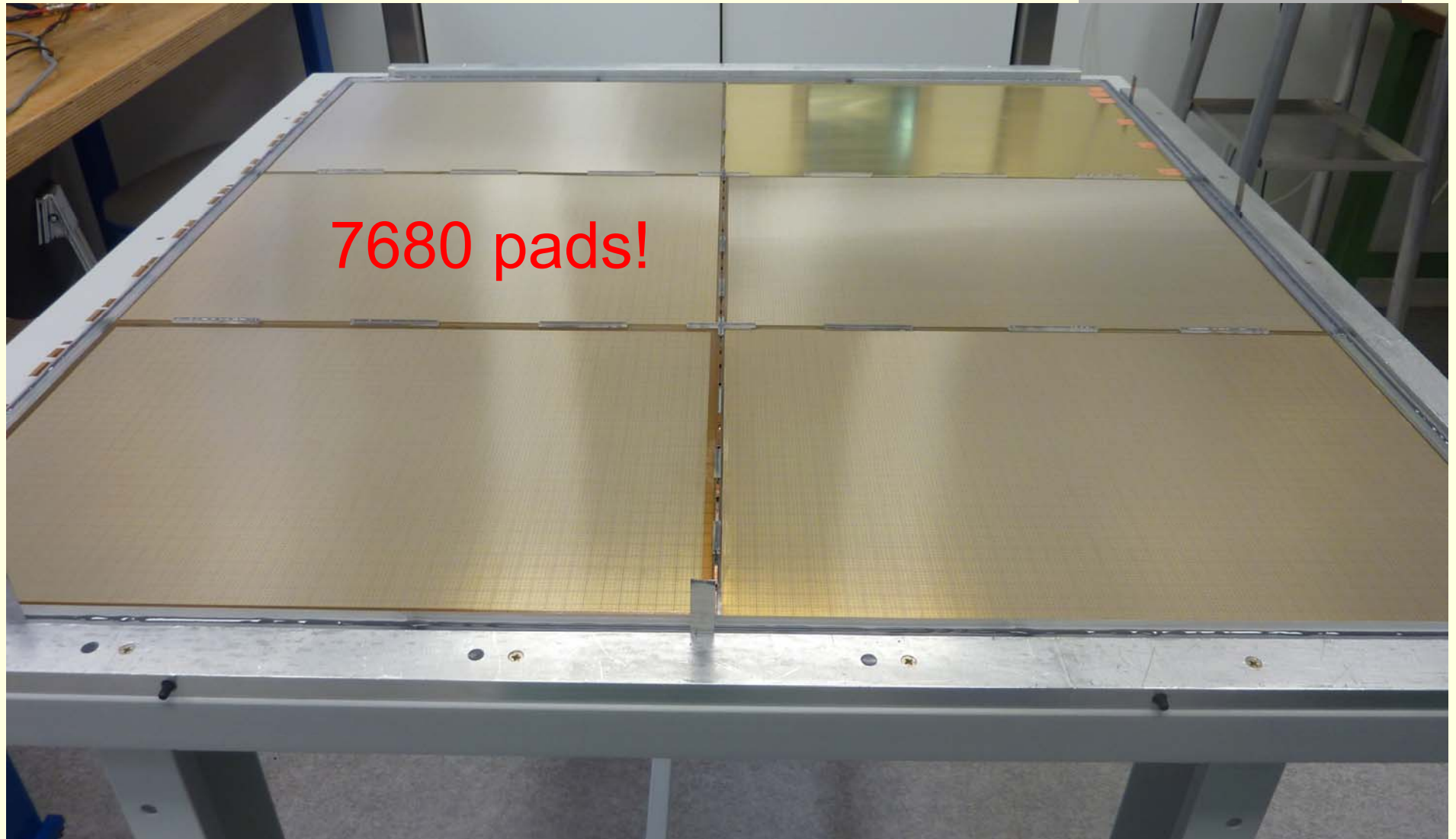
# Beam test plans for 2010

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- Aim: test of the 1 m<sup>2</sup> Micromegas prototype
  - originally only 4 equipped ASU with HR2
- Roadmap
  - tests of individual 32x48 cm<sup>2</sup> ASUs
    - one more ASU with HR2b → time for debugging...
    - special thanks to Olivier Pizzirusso for realising the fifth bulk!
  - Assembly inside a 1 m<sup>2</sup> chamber : last week!
  - Cosmic tests in lab : next week
  - Ready for beam : 10<sup>th</sup> June

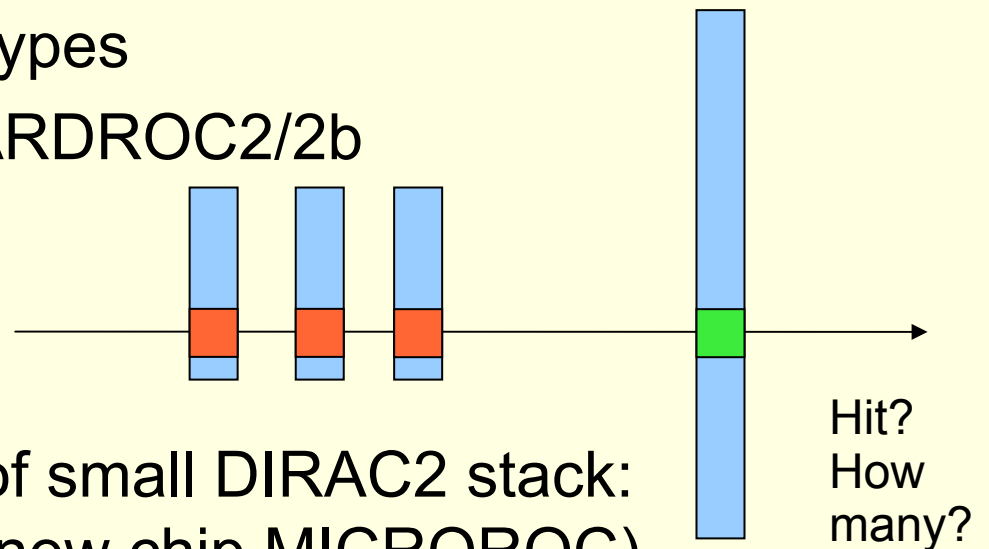
# The 1m<sup>2</sup> prototype

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# Measurements in beam (June 2010)

- Validate large area design, rate effects, sparks effects...
- Efficiency and multiplicity disparity over the 1 m<sup>2</sup> area
- Ideally with MIPs → SPS muon beam
- Detectors
  - scintillators
  - telescope : 3 analog prototypes
  - The 1m<sup>2</sup> prototype with HARDROC2/2b
- 10<sup>4</sup> events per pad, 10<sup>3</sup> pads  
100 Hz DAQ, 10 % duty cycle  
→ need 10-20 days
- Measurement inside magnet of small DIRAC2 stack:  
postponed (priority: design of new chip MICROROC)



# Equipment and installation (June 2010)

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- Detectors :
  - Structure with scintillators, small telescope chambers on a X-Y “red” table
  - 1 m<sup>2</sup> prototype on a second X-Y LAPP table
- Gas mixture
  - Ar/isobutane 95/5 premixed (risk 1), flow of ~ 3 l/h
  - Bring our gas distribution system on TB zone
- Power
  - PM, Micromegas, electronics (10 channels up to 2 kV)
  - High and low voltage supplies in a rack
- Installation : 1 + 1 days

4x4m<sup>2</sup> area needed downstream to H4 magnet  
no change for the RD51 period (gas, location, area...)