

# Micromegas DHCAL 2010 TB plans

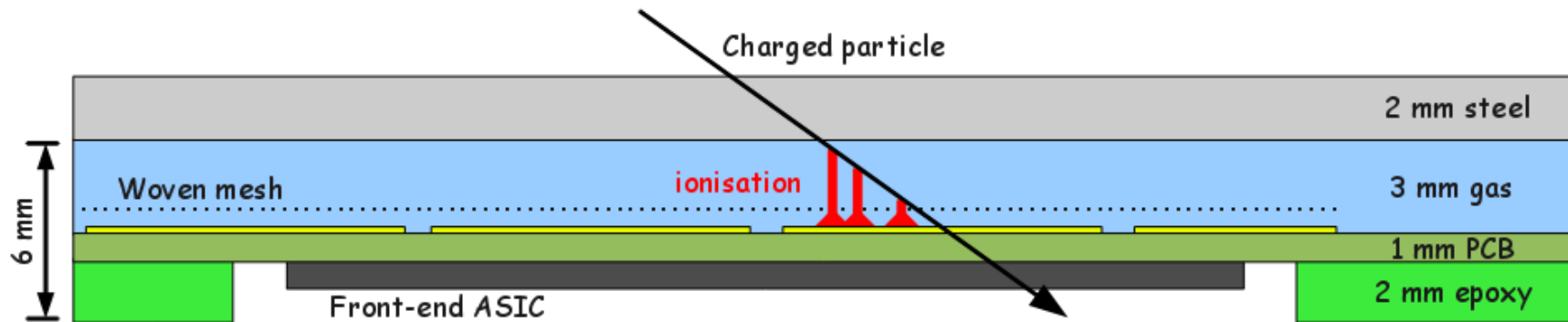
*RD51/WG7 meeting  
M. Chefdeville, LAPP, Annecy  
CERN, Feb. 24<sup>th</sup> 2010*

# Outline

- Detectors
- Past
- Future
- TB request for 2010

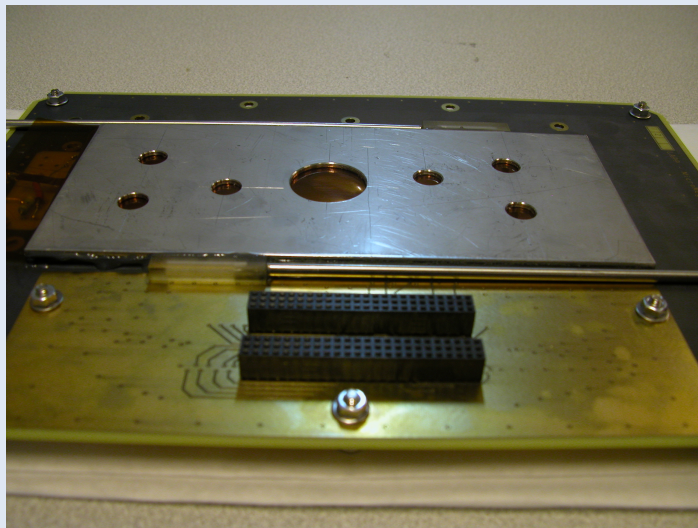
# Micromegas for a DHCAL

- Thickness of 6 mm:  
2 mm steel cover, 3 mm gas, 3 mm PCB/epoxy
- 1 cm<sup>2</sup> readout pads

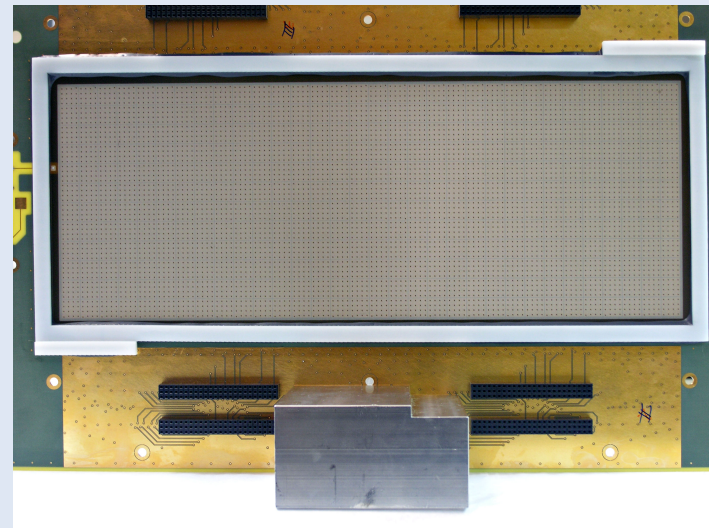


# Micromegas prototypes (I)

- 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)
- 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*

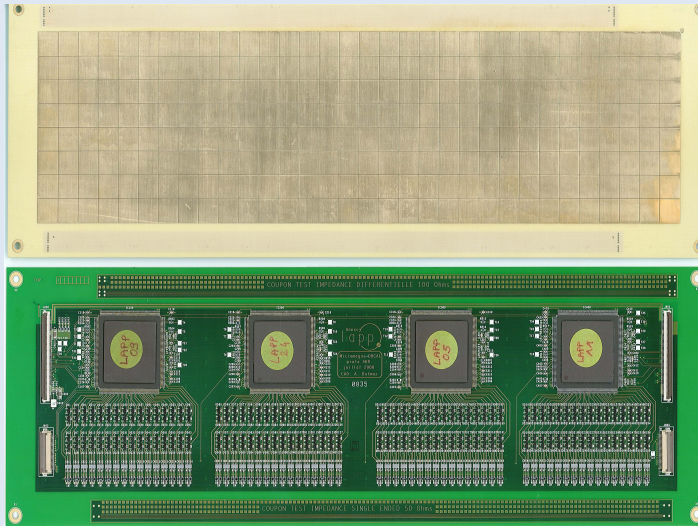


*12x32 cm<sup>2</sup> chamber*

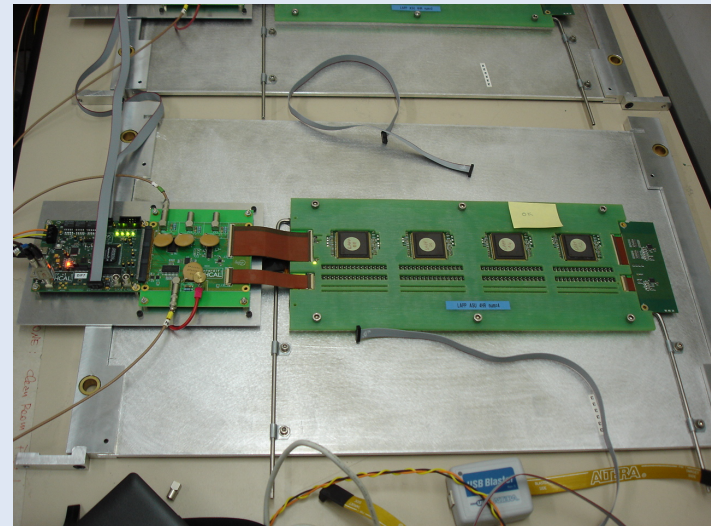


# Micromegas prototypes (II)

- 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 (DIRAC/HARDROC)
- 3<sup>rd</sup> prototypes: 32x48 cm<sup>2</sup>
- 4<sup>th</sup> prototype: 1 m<sup>2</sup>



*8x32 cm<sup>2</sup> PCB with 4  
HARDROC and pads*

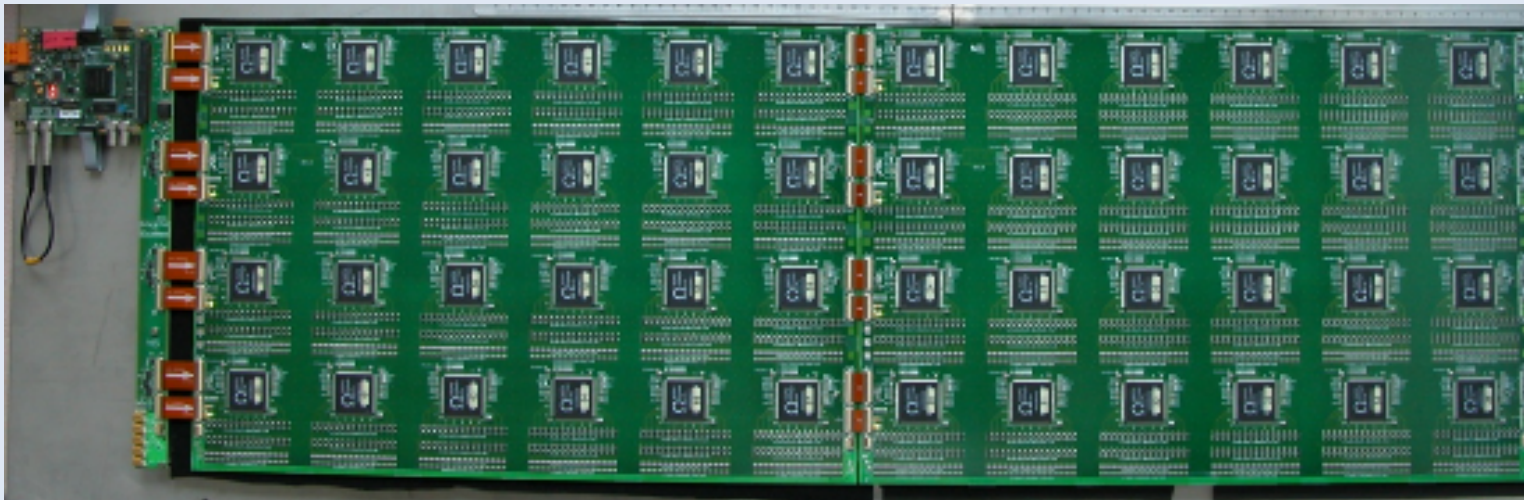
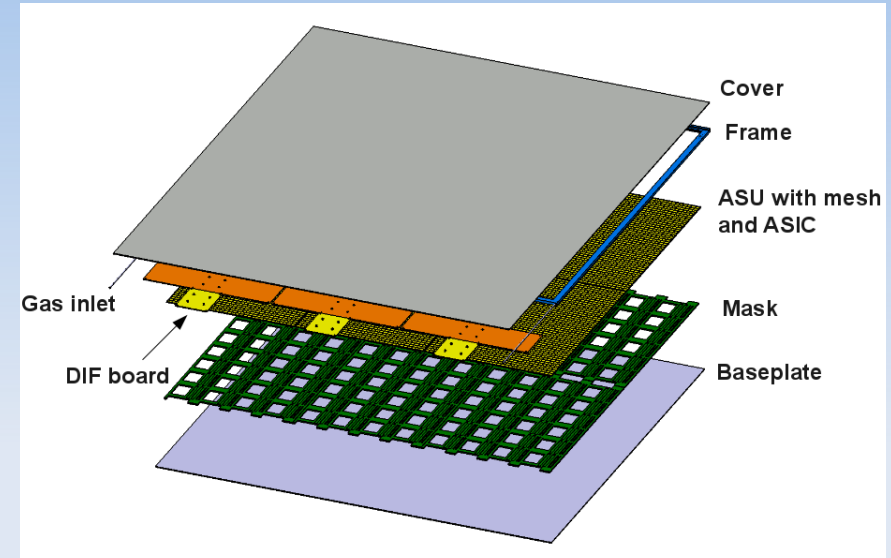


*8x32 cm<sup>2</sup> chamber  
with DAQ*

# 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 (DIRAC/HR)
- 3<sup>rd</sup> prototypes: 32x48 cm<sup>2</sup>
- 4<sup>th</sup> prototype: 1 m<sup>2</sup>

x 3

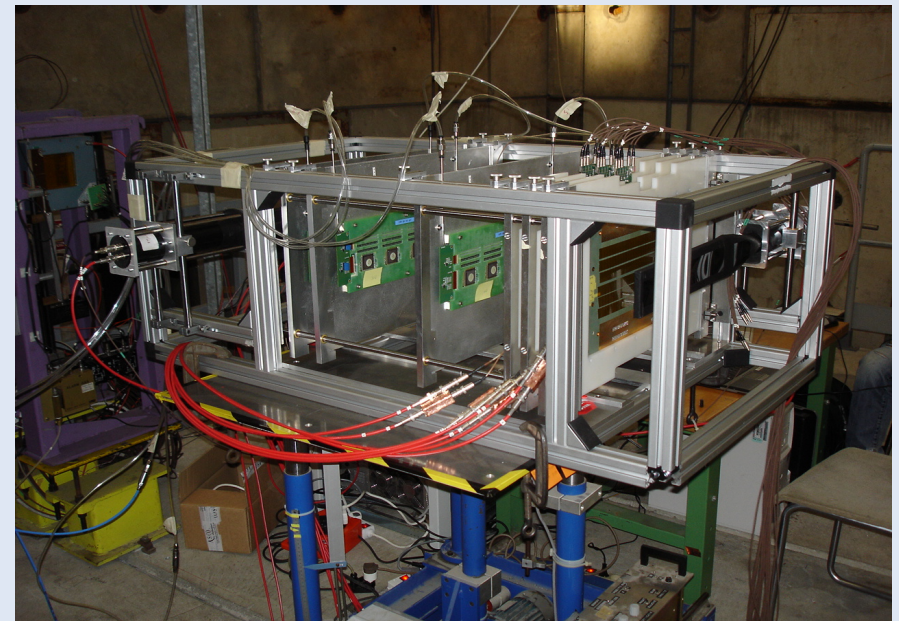
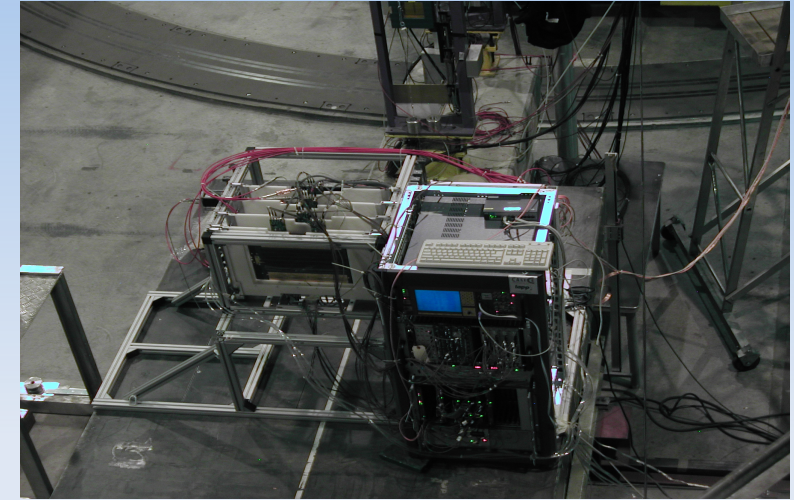


*2 chained ASU of 32x48 cm<sup>2</sup> with 24 HARDROCV2 each*



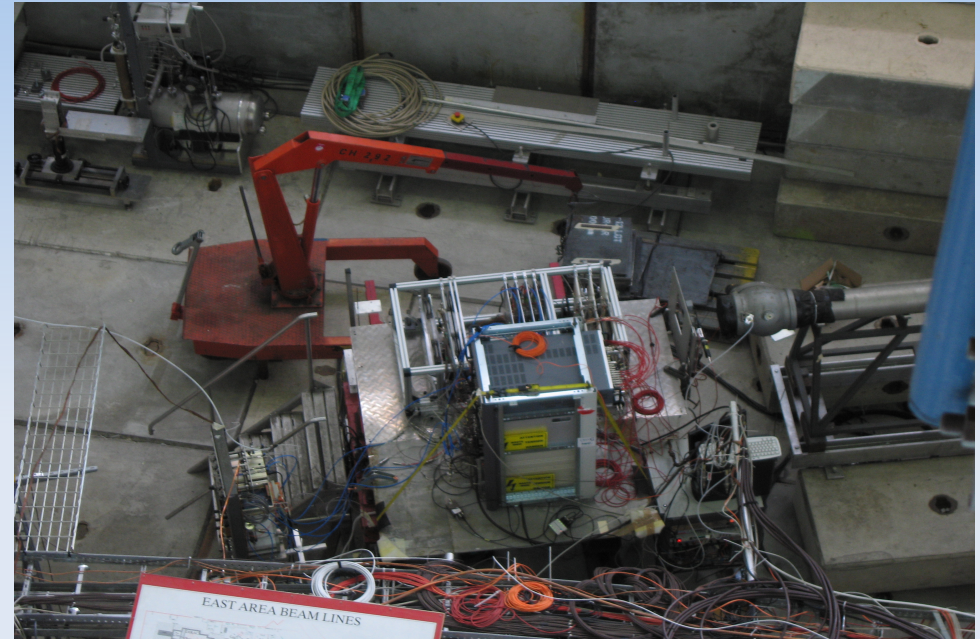
# Past beam tests (I)

- August 08 @ SPS  
test of analog prototypes  
with help from Irfu  
Test of digital prototypes (DIRAC)  
→ 2009 JINST 4 P11023
- November 08 @ PS  
test of digital prototypes  
(HARDROC)
- 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 HARDROC chips**  
**→ 2010 JINST 5 P01013**
- November 09 @ PS

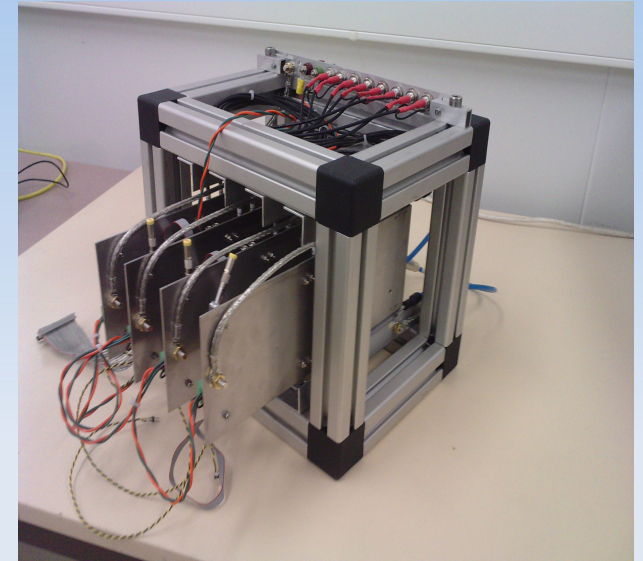




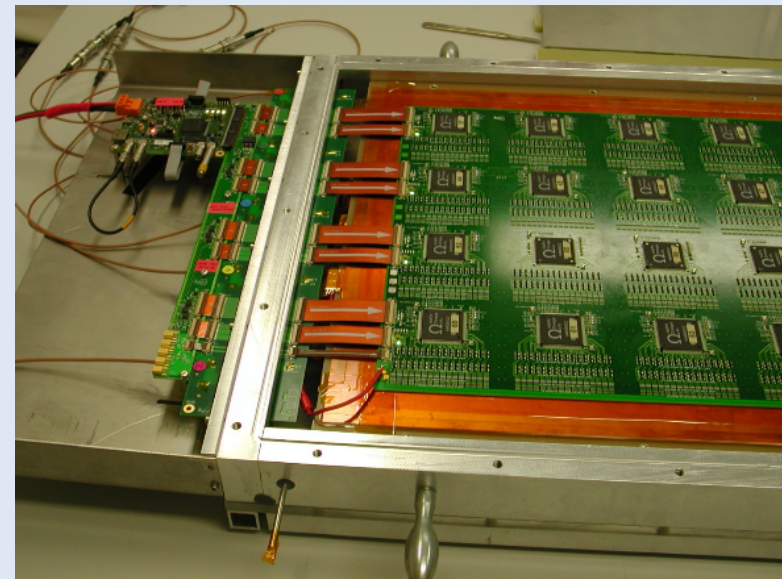
# Past beam tests (III)

- 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> DIRAC chips and**  
**32x48 cm<sup>2</sup> HARDROCv2**

8x8 cm<sup>2</sup>  
DIRAC



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

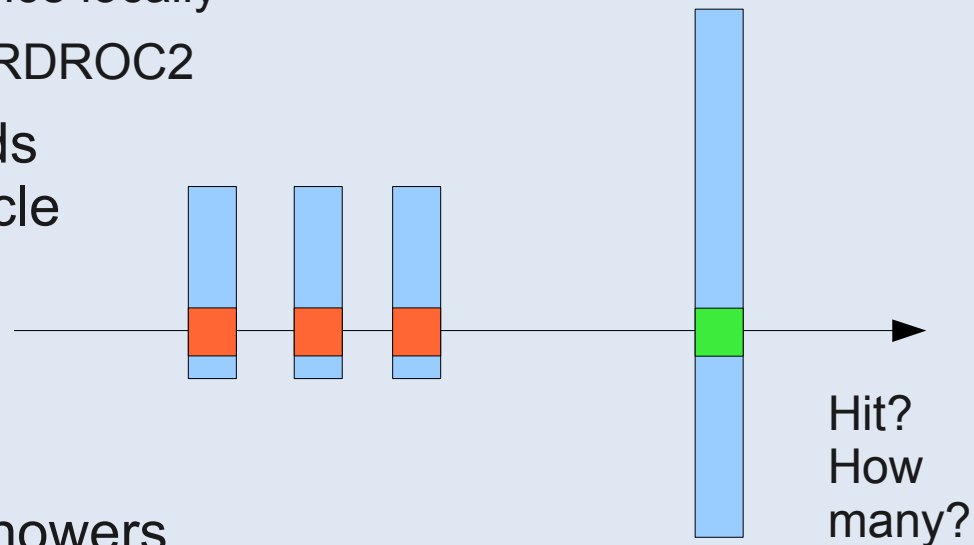


# Beam test plans for 2010

- Test of a 1 m<sup>2</sup> Micromegas prototype
- Roadmap
  - Now testing individual 32x48 cm<sup>2</sup> units
  - Assembly inside a 1 m<sup>2</sup> chamber in March
  - Cosmic tests in lab during May-June
  - Ready for beam beginning July

# Measurements in beam

- Efficiency and multiplicity and their variation across the 1 m<sup>2</sup> area
- Ideally with MIPs → SPS muon beam
- Detectors
  - Three 8x32 cm<sup>2</sup> prototypes with HARDROC1 telescope to study performance locally
  - One 1 m<sup>2</sup> prototype with HARDROC2
- 10<sup>4</sup> events per pad, 10<sup>3</sup> pads  
100 Hz DAQ, 10 % duty cycle  
→ need 10-20 days



- Measurements in hadron showers  
Measurement inside magnet of small DIRAC stack  
Validate R&D large area, spark proofness, rate effects...

# Equipment and installation

- Detectors
  - Structure with scintillators, small telescope chambers on 1 m<sup>2</sup> XY table
  - 1 m<sup>2</sup> prototype on (a few m<sup>2</sup>) XY 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 2000 kV)
  - High and low voltage supplies in a rack
- Installation
  - Move in: 3 days
  - Move out: 2 days



# LAPP group requests

- 2 weeks on H2 or H4 from June to mid-July  
request done through CALICE  
→ measure calorimeter performance
- 1 week on H4 in July  
request done through RD51  
beam time could be shared with Irfu group  
→ validate R&D on large area (spark protection...)
- Part of the CALICE/W-HCAL beam request  
2 weeks in October on PS  
→ test of  $m^2$  prototype in W-structure (showers)
- So far: June 17<sup>th</sup> → July 1<sup>st</sup> (incl. 3 days of MD)  
followed by 1 week RD51 (users?)