WG7 Summary

Yorgos Tsipolitis (NTUA)

CALICE

Set-up

Detectors

- Telescope
  - 4 Gassiplex chambers
  - 3 scintillators
- 1 m^2 prototype
  - 4 ASUs with 24 HR2
  - 1 ASU with 24 HR2b

Trigger

- Coincidence PM
  + READY of 2 acquisitions
- Delay of 1 μs to m^2

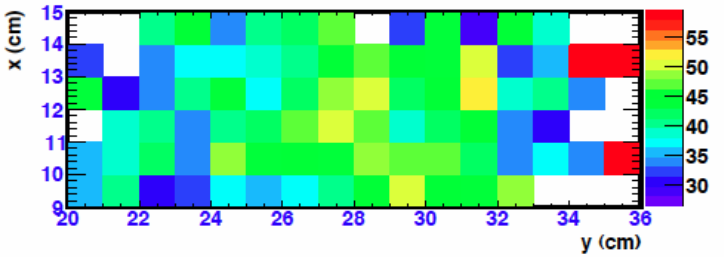
Rates

- Beam: 150 GeV/c muons
  100–500 kHz over 5×5 cm^2
- Acq. rate $\sim$ 100 Hz

Efficiency and multiplicity - 420 V (I)

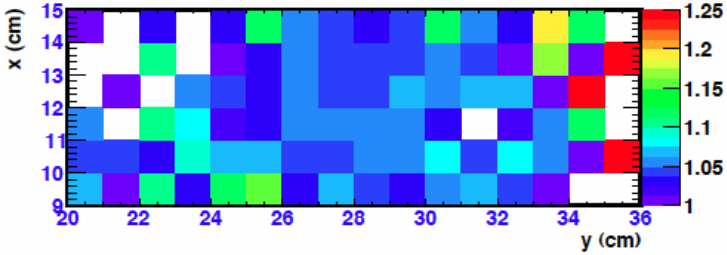
Run @ 420 V

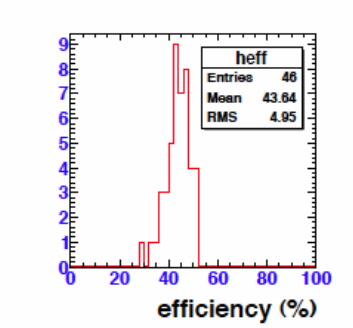
- High gas gain (10^4)
- Low *thr* of 1–2 DAC units

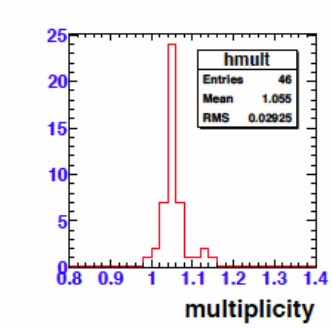


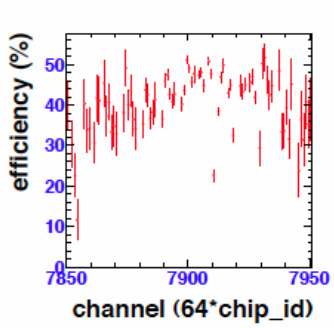
Best performance

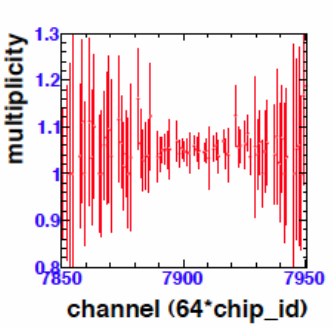
$\overline{\epsilon}$ (%)	σ_ϵ (%)	$\overline{m}$	σ_m
43.6 ± 2.6	5	1.05 ± 0.03	0.03











Future plans

MICROROC new ASIC

- Shaping time up to 200 ns
- Noise on test board: 0.24 fC
- 350 chips available (2 m^2)

Next m^2 prototypes

- Now: 6 ASU with 24 ROCs
- Calibration on-going
- Bulk at CERN in May
- Assembly in June

Test beam in 2011

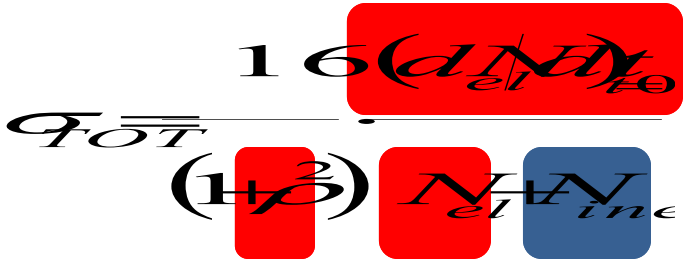
- 3–9/08 (CALICE)
  9–21 (RD51)
- Would like to use
  the Micromegas telescope
- RD51 users welcome
  during CALICE period
- Our settings:
  150 GeV/c muons
  rate $\leq$ 1 kHz

2011 TOTEM T2 Test Beam Plans

TB aim: Collect data for…

- 1. T2 optimization "Before the Long Shut Down".
- 2. Triple GEM design optimization for forward regions & high luminosity (T2 optimization "During the Long Shut Down" and GEM RD)

TOTEM



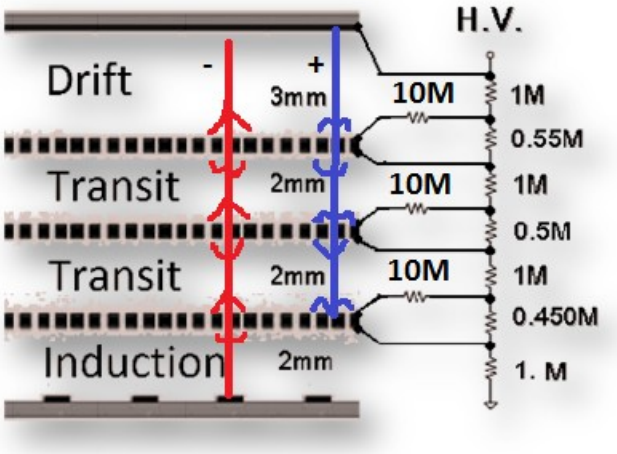
Elastically (or quasi) Scattered protons
-220m
-147m
RP-
Inelastic Events
T2-
-14m
T1-
-9m
CMS
Inelastic Events
T2+
14m
T1+
9m
Elastically (or quasi) Scattered protons
147m
220m
RP+

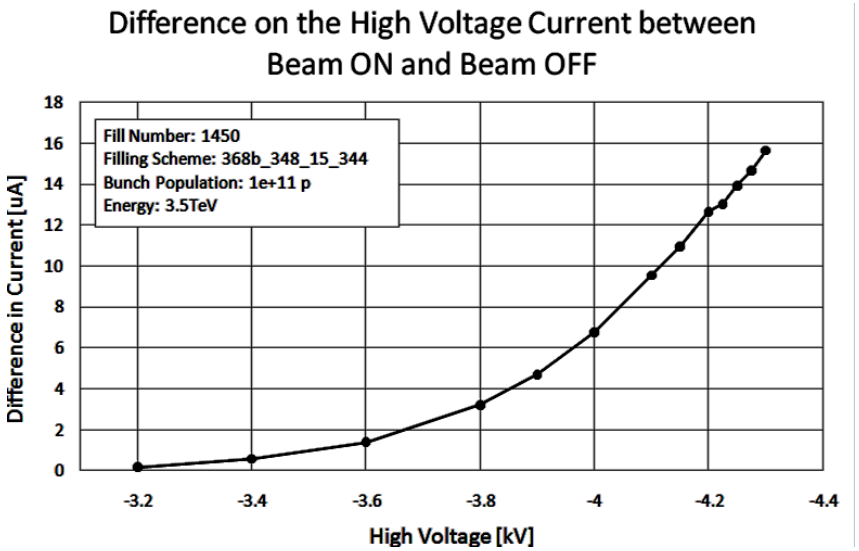
IP5

T2: a T2 limit with high luminosity

T2 Environment: Large amount of particles (primary and secondary) per collision.
T2 Gain: High GAIN to be efficient in the actual configuration

The amplified charge collected by the foils will cause a voltage drop across the 10Mohm protection resistors.





In high intensity beams the current flowing in the foils can reach few μA and the effect on the gain is not negligible.
MANDATORY: reduce as much as we can the detector GAIN

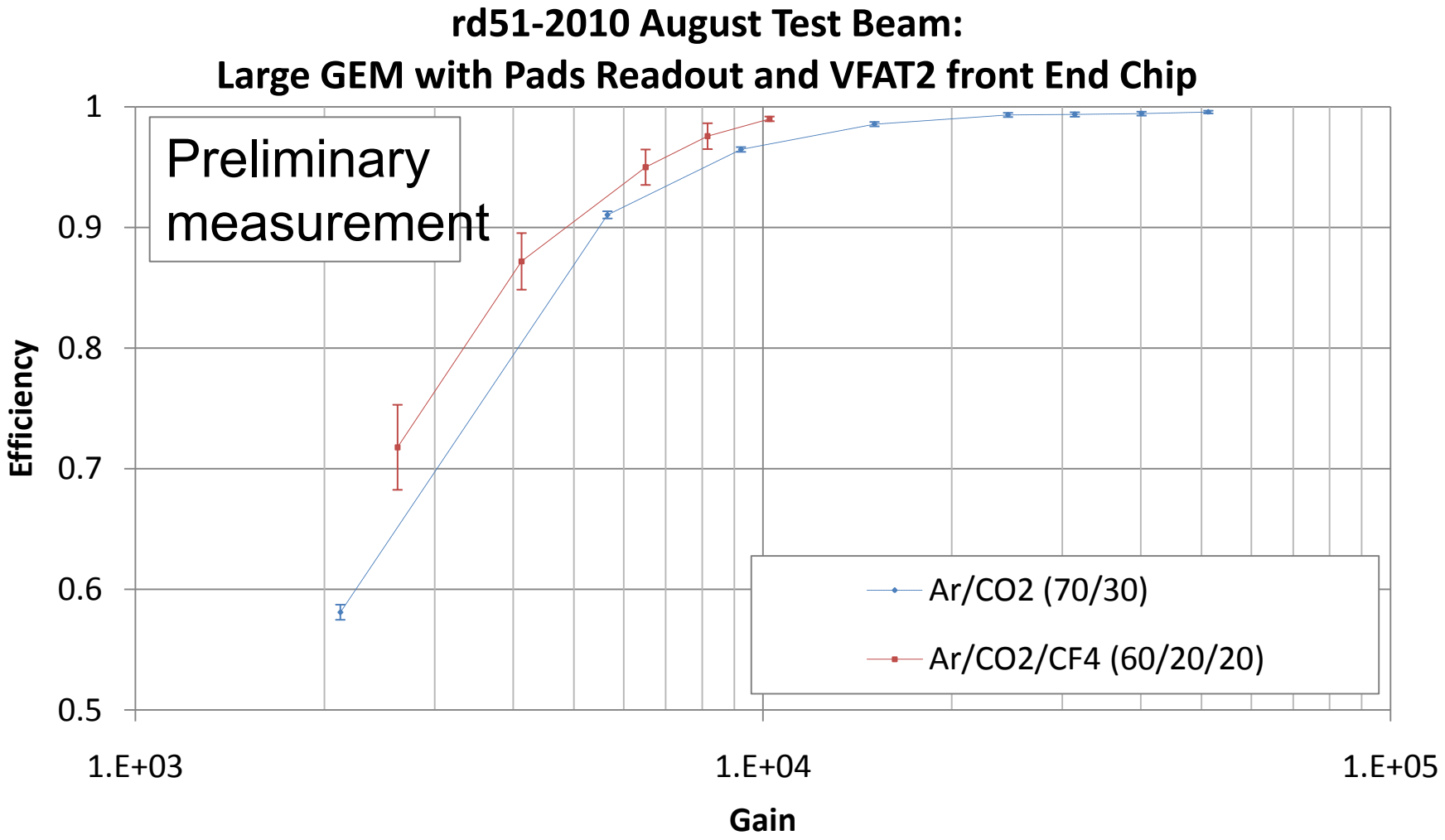
T2 optimization: Signal

Gas mixture studies:
Actual mixture: Ar/CO2 70/30

- Migration to Ar/CO2/CF4 in a ratio optimized for the internal field configuration that we have.
  - Lab. Gain calibration Curves
  - Test Beam Efficiency and Timing Studies

Increase the Signal → Lower the Gain
(VFAT2 shaping time=22ns)

2010 test beam: preliminary measurement with Ar/CO2/CF4



2011 TOTEM T2 TB Plans

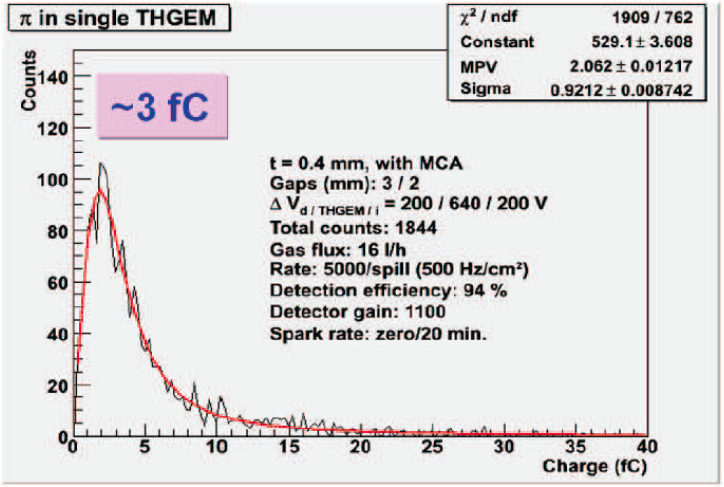
- 1. T2 (as it is now) optimization (BLSD*) → reduce the detector GAIN
  - Front end chip (Noise)
  - Gas mixture (Signal)
- 2. Triple GEM design optimization for forward regions & high luminosity
  - Gas mixture & fields & Internal structure (gaps).
  - Readout Planes

(*) Before the Long Shut Down

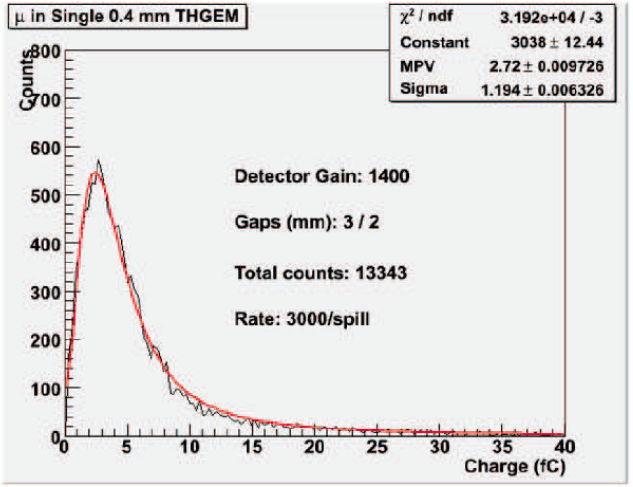
DHCAL THGEM

August Results - μ vs π

PIONS



MUONS



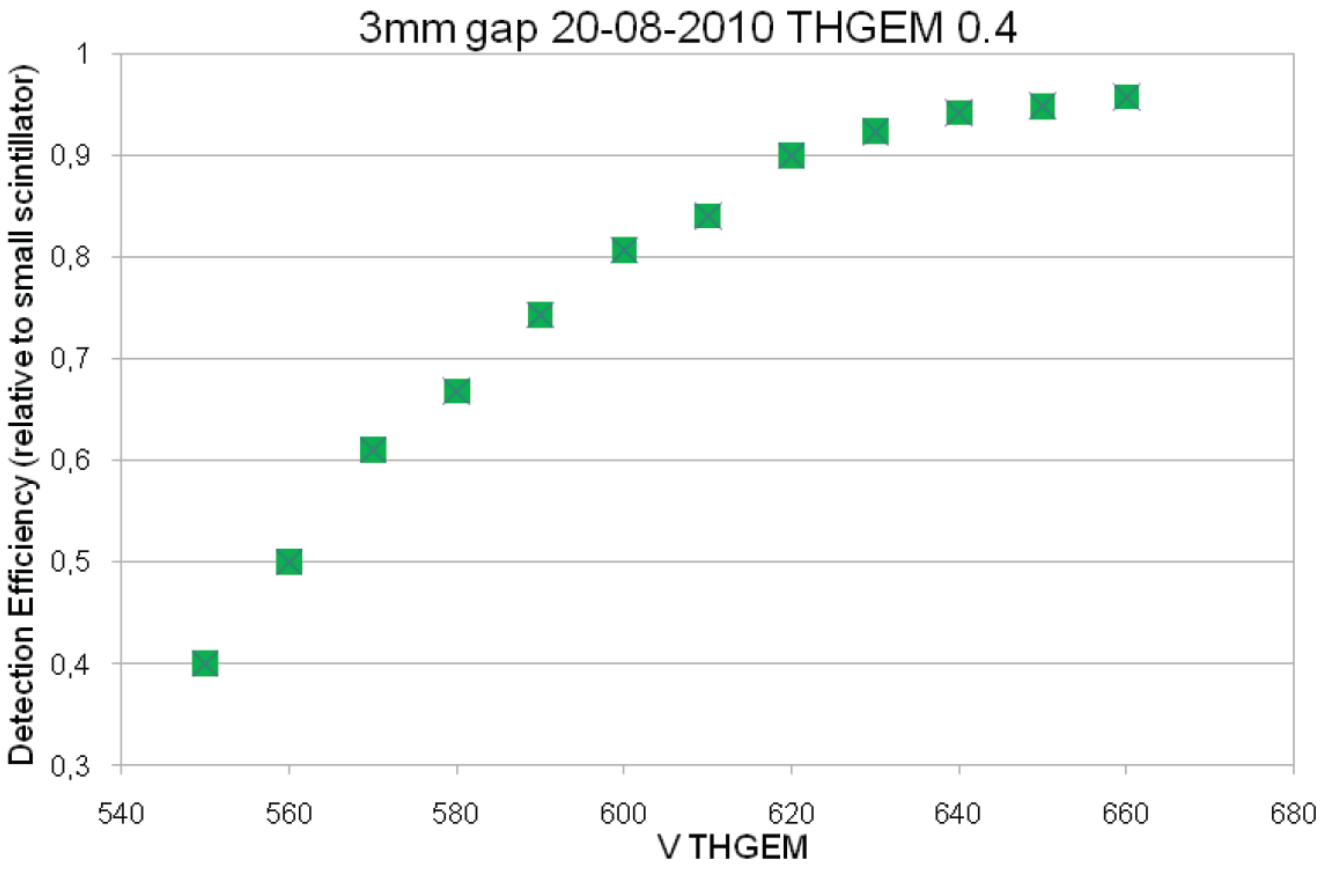
Measured very low discharge rates even with pions @ rates >>ILC

THGEM: 0.4mm

Gain: 1200-1400

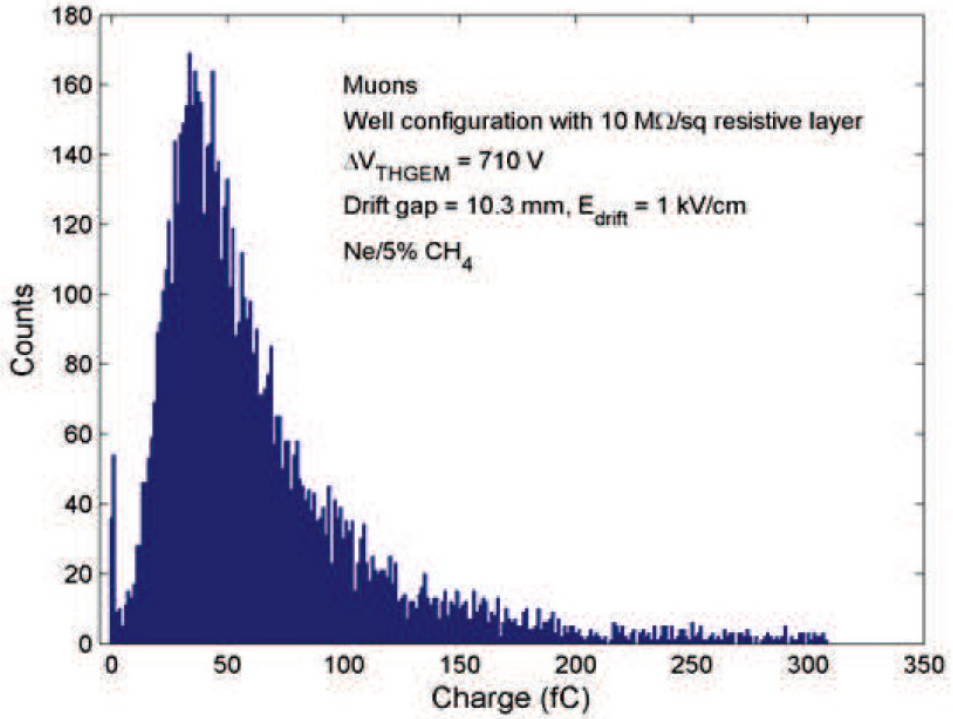
- Muons ans pions easily measured, but charge signals very low,
- Spark rate was fine, but KPiX needed higher signals (> 15 fC).

August Results - efficiency



Maximum detection efficiency ($\epsilon = 96\,\%$) was reached very early, even with a small drift gap.

Resistive Well-THGEM



- Acquisition with standard electronics chain (KPiX was not working);
- Very high gain with no sparks (~ 5600);
- Charge pulses more than enough for KPiX.

2011 plans

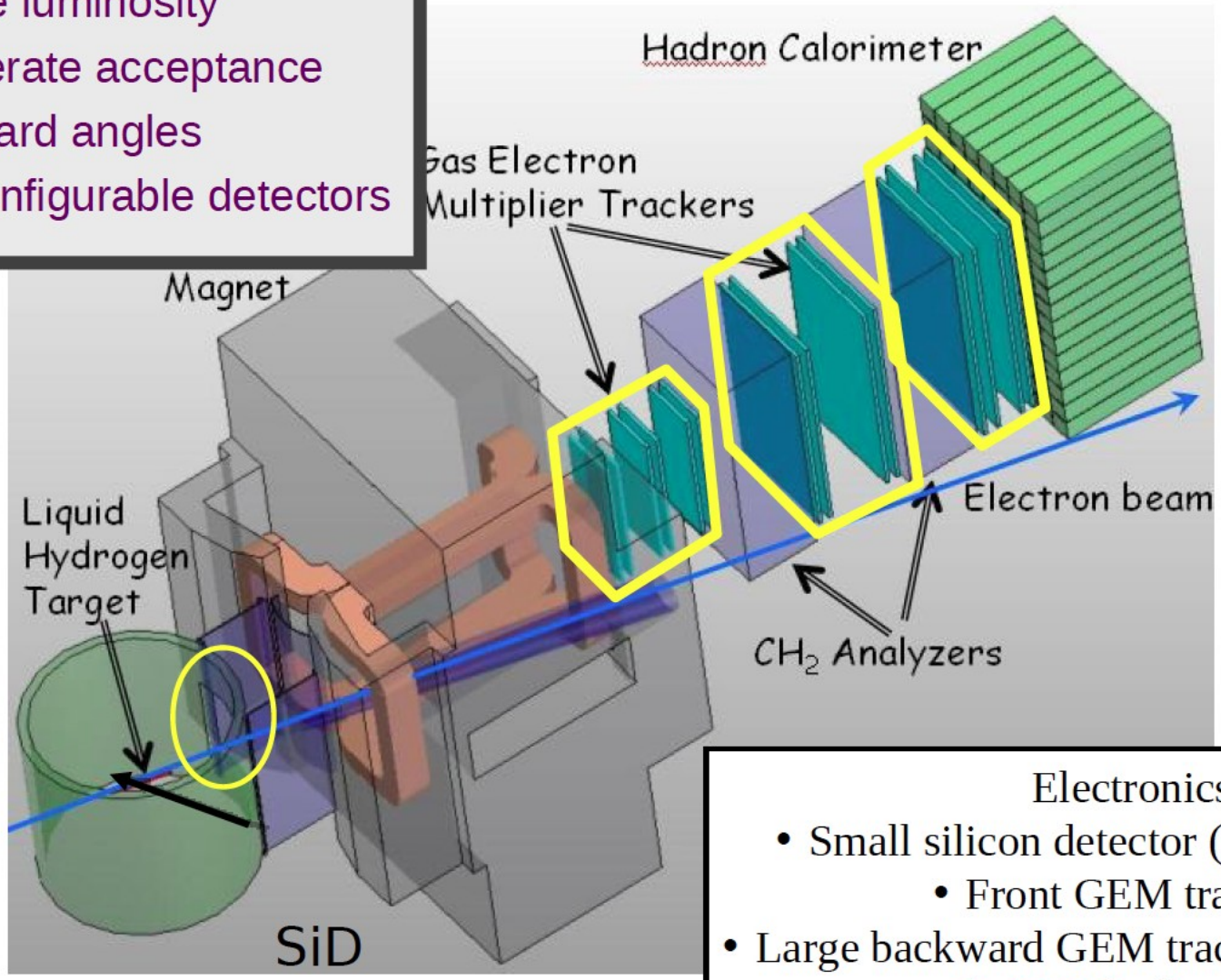
DHCAL studies for THGEM chambers + Kpix9:

- Establish working Kpix9 readout, check data against previous results.
- Establish MIP signals, noise distributions for low rate beam in a number of pads.
- Measure the variation of MPV of Landau distributions with HV for a series of chamber positions/pads - move the chamber to hit different pad areas.
- Take combined data with THGEM and tracker system to establish tracks/pads correlations.
- Take series of runs with the chamber moving the chamber across beam to measure efficiency for each pad, sharing of signals between pads.
- Rate/time resolution studies.

Jlab GEM Tracker

SBS Spectrometer in Hall A

- Large luminosity
- Moderate acceptance
- Forward angles
- Reconfigurable detectors



Electronics for:

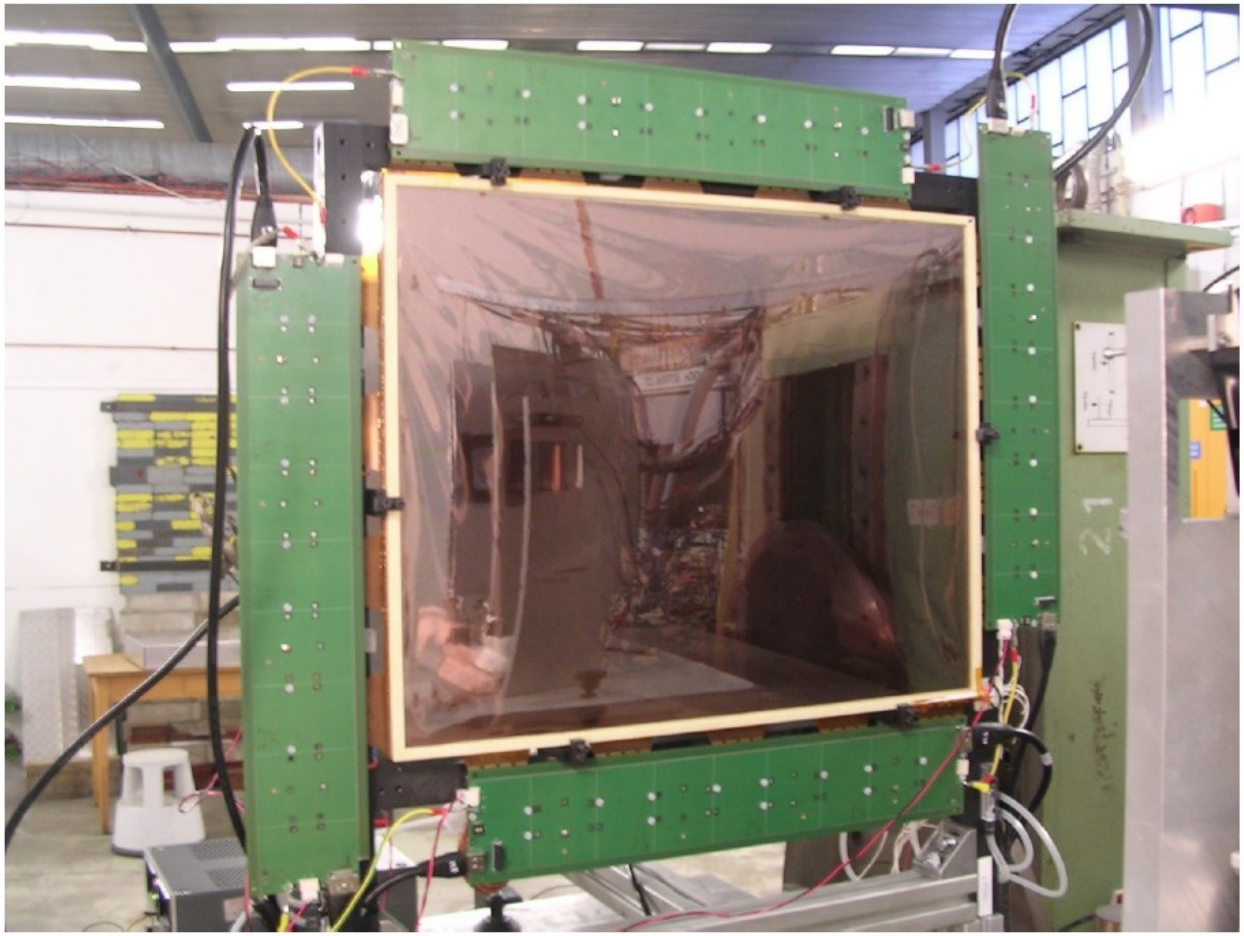
- Small silicon detector (SiD)
- Front GEM tracker
- Large backward GEM trackers

⇨ **>100k channels**

Prototype to be tested

- Fully equiped 3xGEM 40x50 cm2 module
- 2D readout, 400 um strip pitch
- 18 front-end APV25 cards (2304 channels)

- Gas: Ar/CO2 70/30

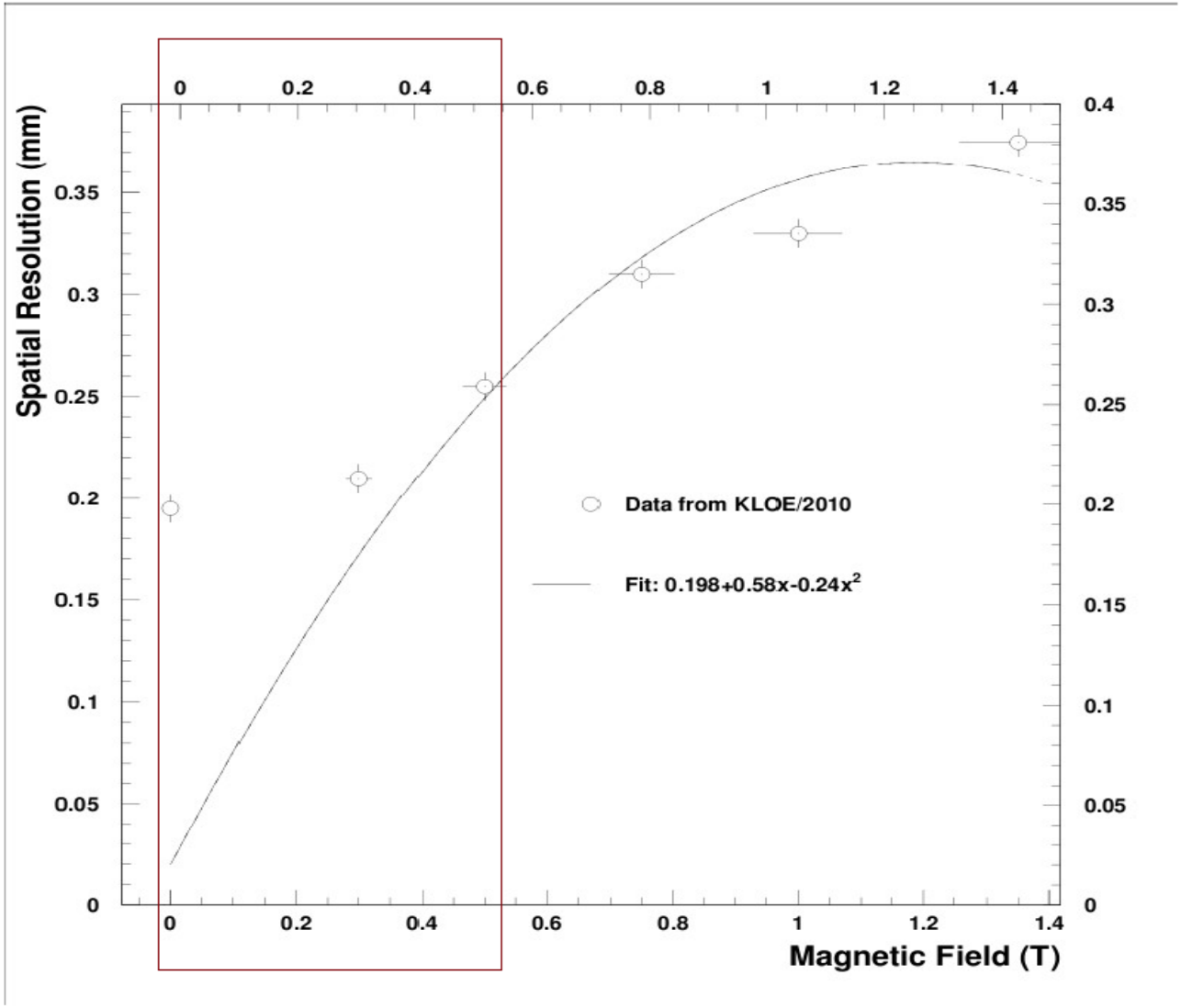


Front End Cards on the other side of the backplanes

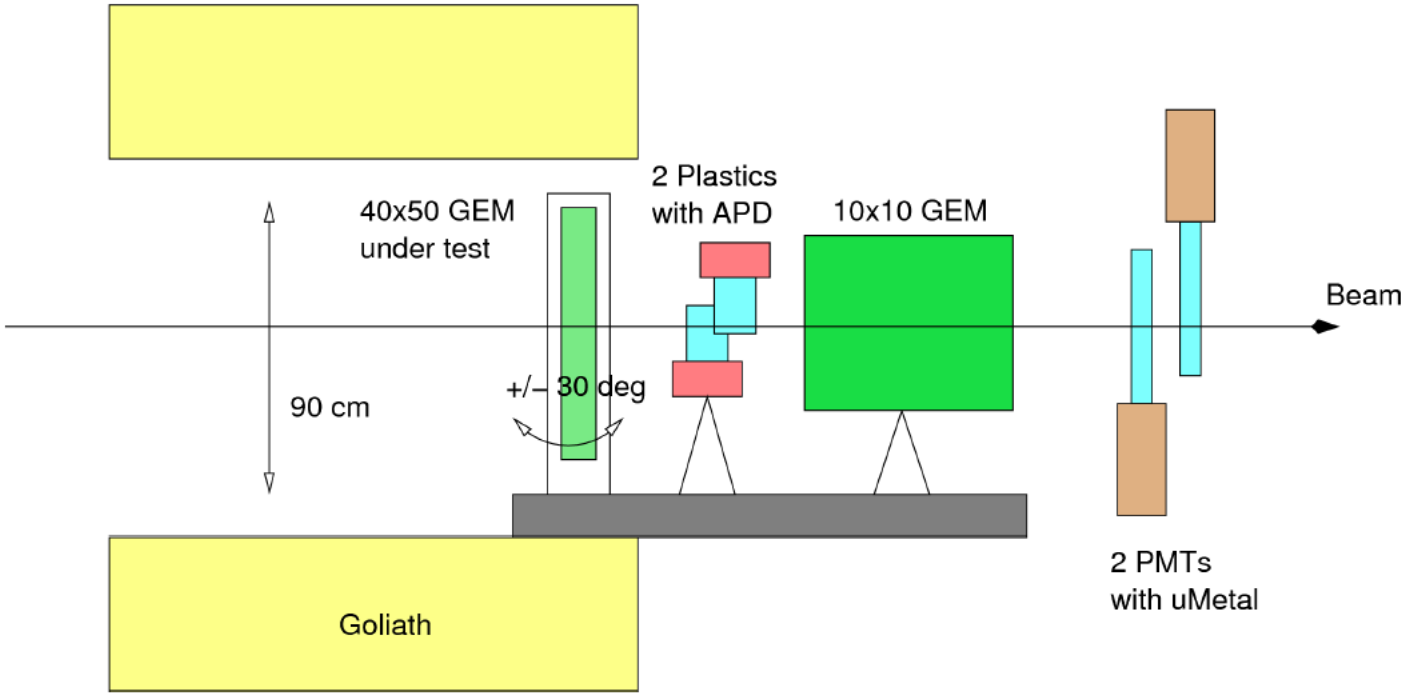
Purpose of the Test

- Characterize the 40x50 cm^2 3xGEM module prototype in terms of:
  - Cluster width and displacement
  - Collected charge
  - Efficiency
  - Residuals
- Study in Magnetic Field up to 500 Gauss
- Study at highest intensity beam (?)
- Further characterization of the APV25 based electronics (field effects, noise ...)

Verify assumption at low field



Setup



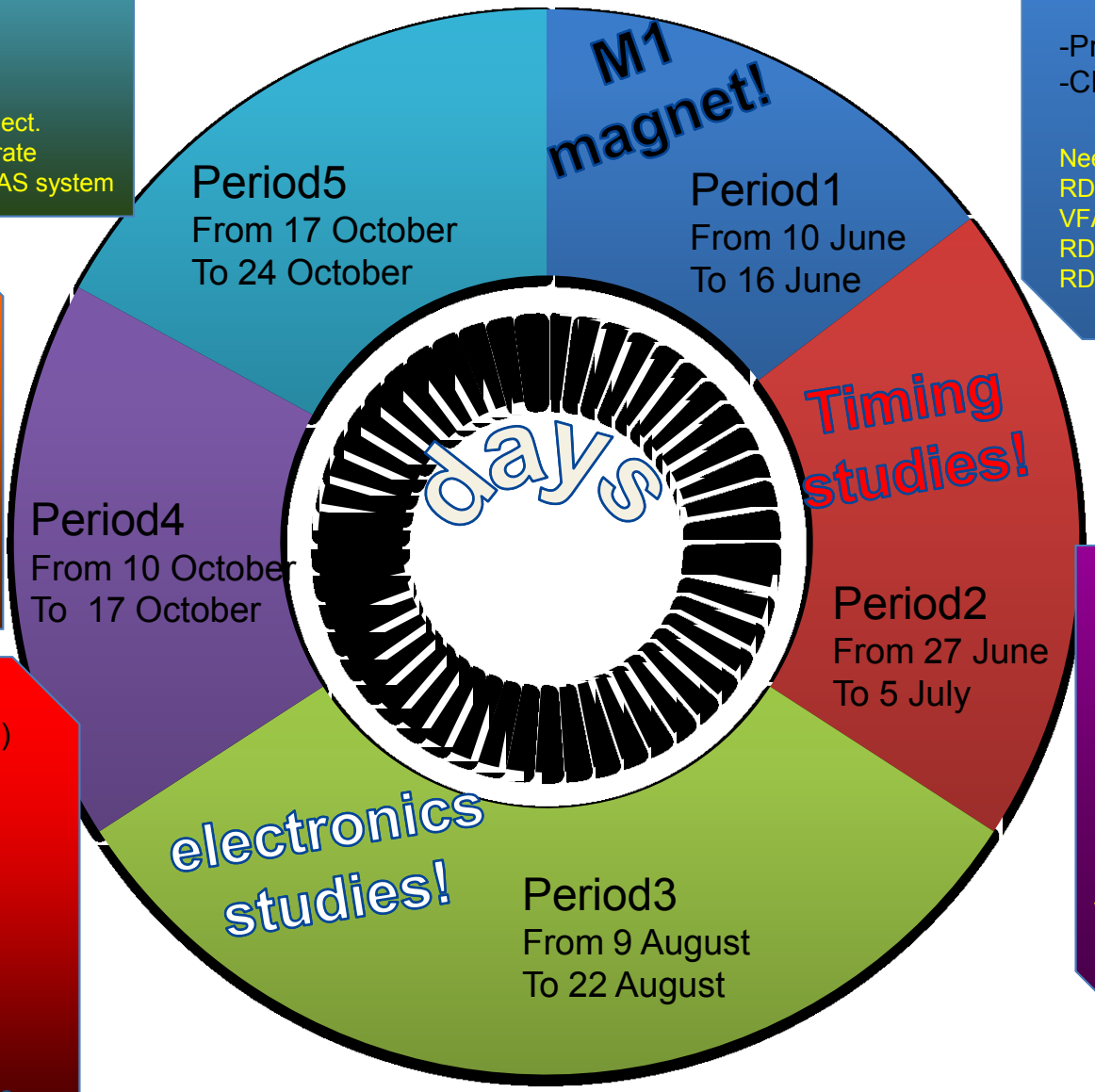
Detector Under Tests: 40x50 cm2 – 3xGEM Prototype

Ancillary Detectors:
2 PMTs
2 APDs
RD51 GEM (or uM)

- Use of Goliath (up to 500 Gauss)
- Gas: Ar/CO2 70/30 (premixed)

Periods Overview

North Area vacation resort!



SPS-H4
(together with RD51)

-Proto IV (?)

Needed:
RD51 tracker
VFAT+TURBO elect.
RD51 DAQ pc+crate
RD51 portable GAS system

SPS-H2

-Proto_II
-CMS_timing_GEM

Needed:
RD51 tracker
VFAT+TURBO elect.
RD51 DAQ pc+crate
RD51 portable GAS system

SPS-H4
(together with GSI)

-Proto IV (?)

Needed:
RD51 tracker
VFAT+TURBO elect.
RD51 DAQ pc+crate
RD51 portable GAS system

SPS-H4
(together with RD51)

-Proto_II
-CMS_timing_GEM
-Proto_III

Needed:
RD51 tracker
VFAT+TURBO elect.
RD51 DAQ pc+crate
RD51 portable GAS system

SPS-H4
(together with RD51)

-Proto_II
-CMS_timing_GEM
-Proto_III
-Proto VI (?)

Needed:
RD51 tracker
VFAT+TURBO elect.
RD51 DAQ pc+crate
RD51 portable GAS system

Detector summary

built

CMS_timing_GEM: Double mask 10x10cm^2 1D readout (3/2/2/2); 256 channels

built

CMS_Proto_I: Single mask FULL_SIZE 1D readout (3/2/2/2); 1024 channels

in construction

CMS_Proto_II: Single mask FULL_SIZE 1D readout (3/1/2/1); 8192channels

built

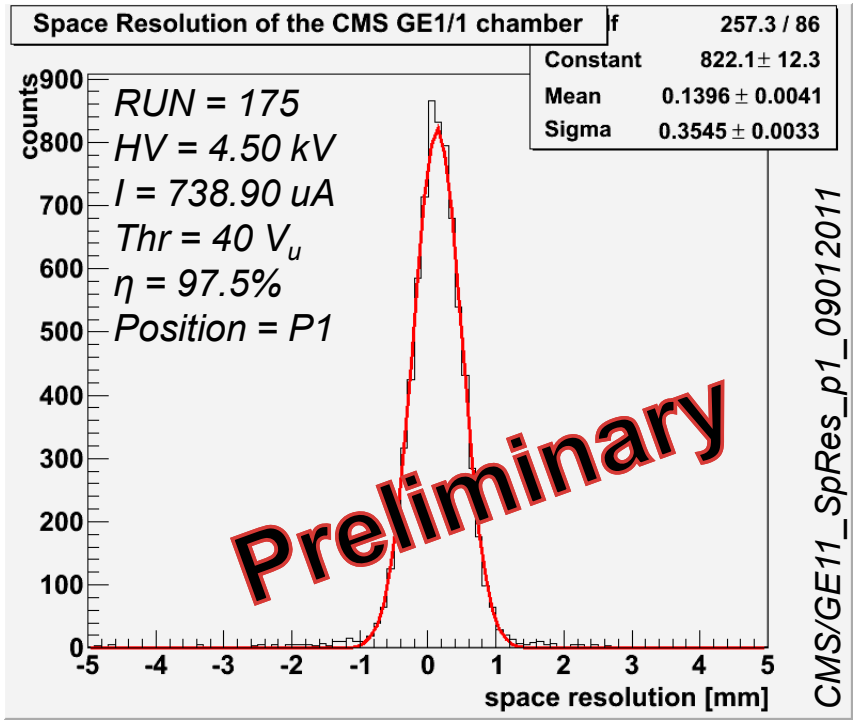
CMS_Proto_III: Single Mask 10x10cm^2 [N2] (3/1/2/1); 256 channels

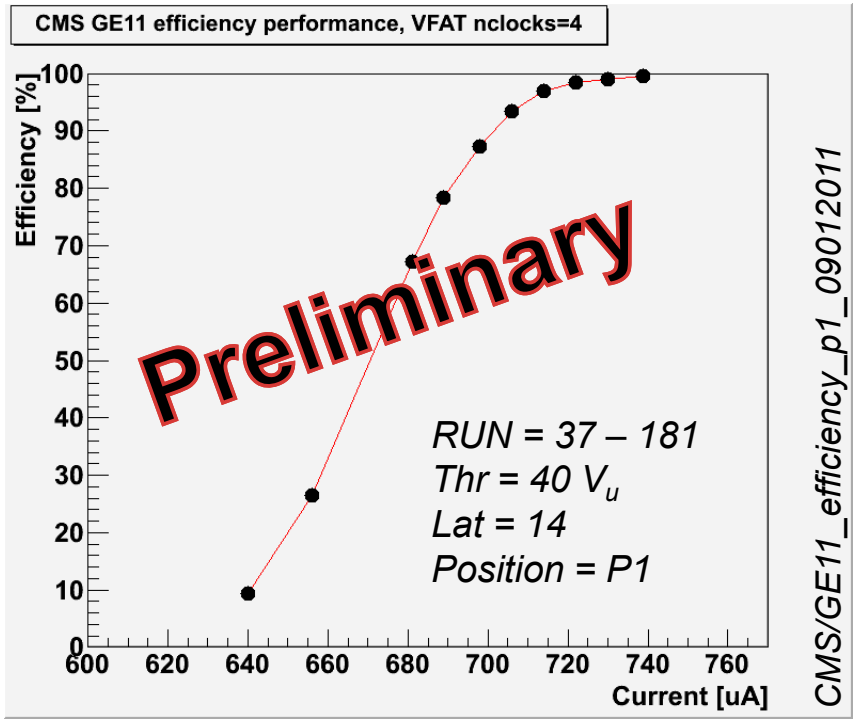
scheduled

CMS_Proto_VI: Single Mask FULL_SIZE 1D [N2] (3/1/2/1) 8192 channels

GE1/1 Prototype in details: last TB

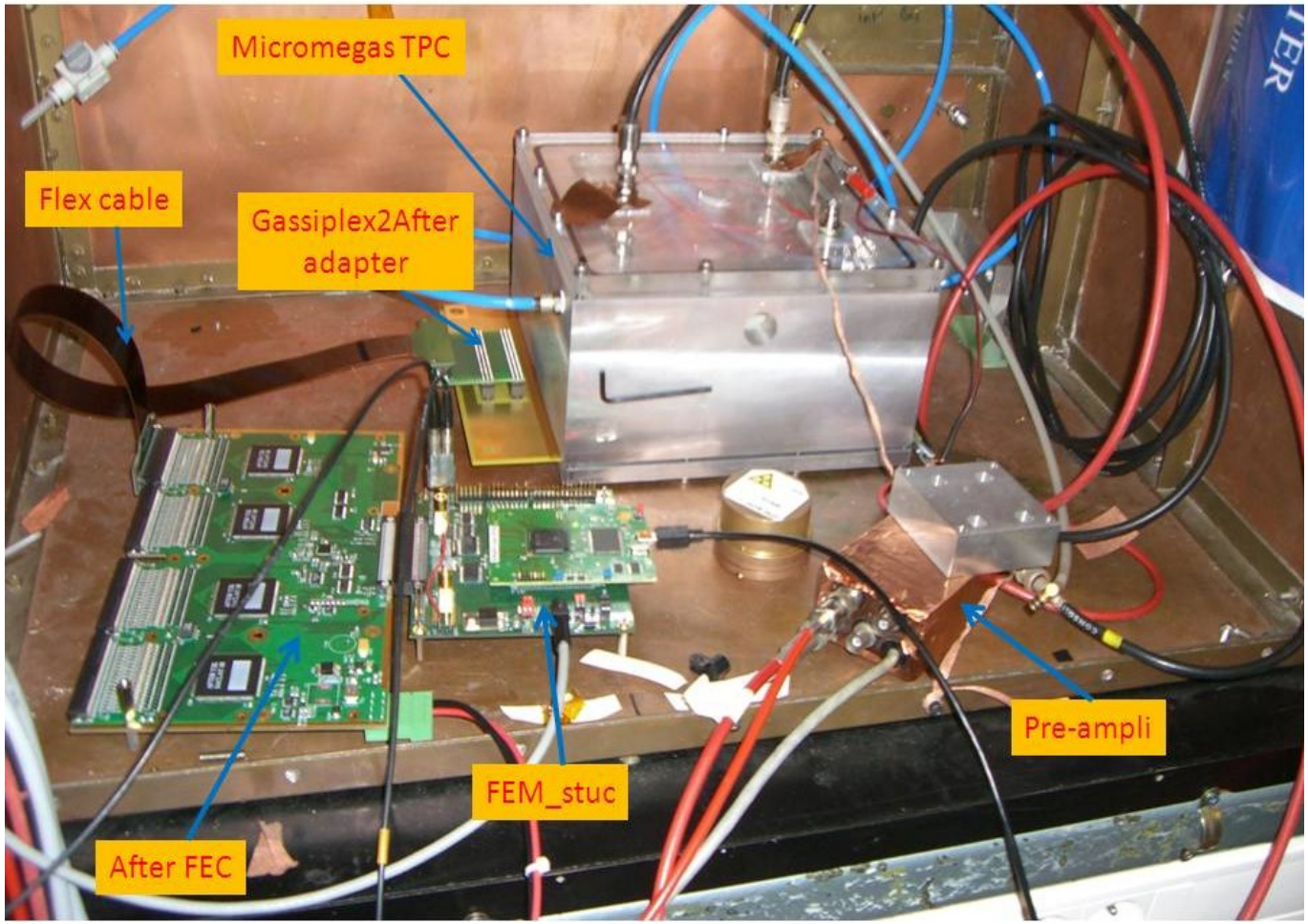
CMS_Proto_I



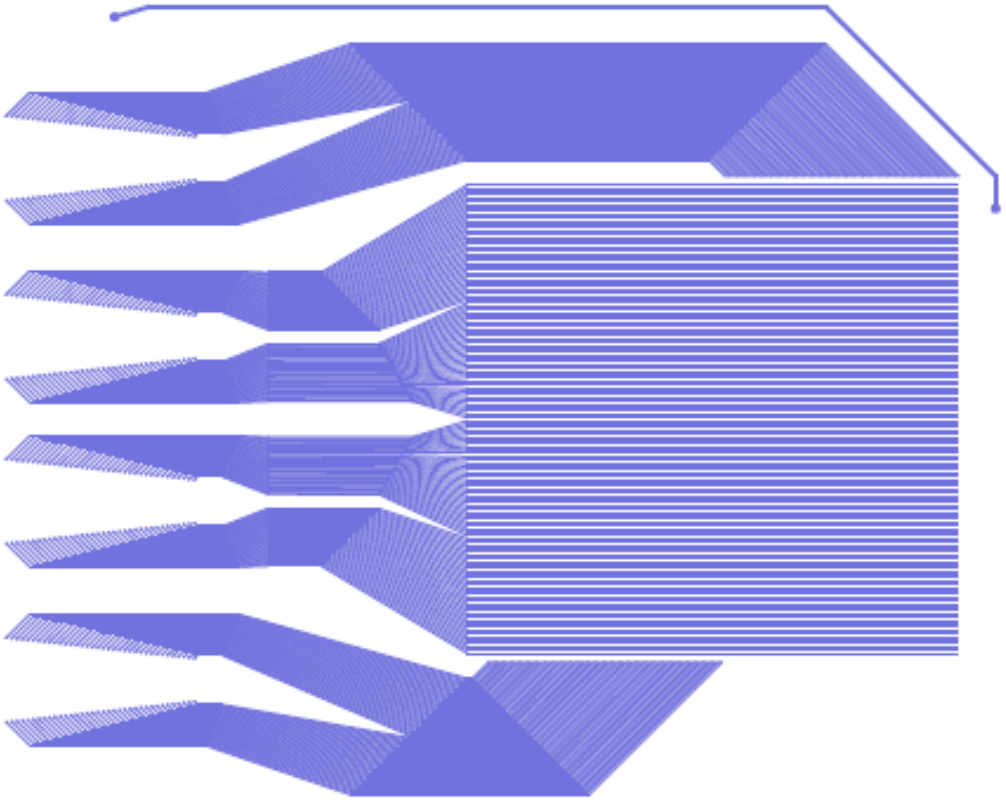


Data-taking focused on different points along the GE1/1.
Preliminary results show good performance.

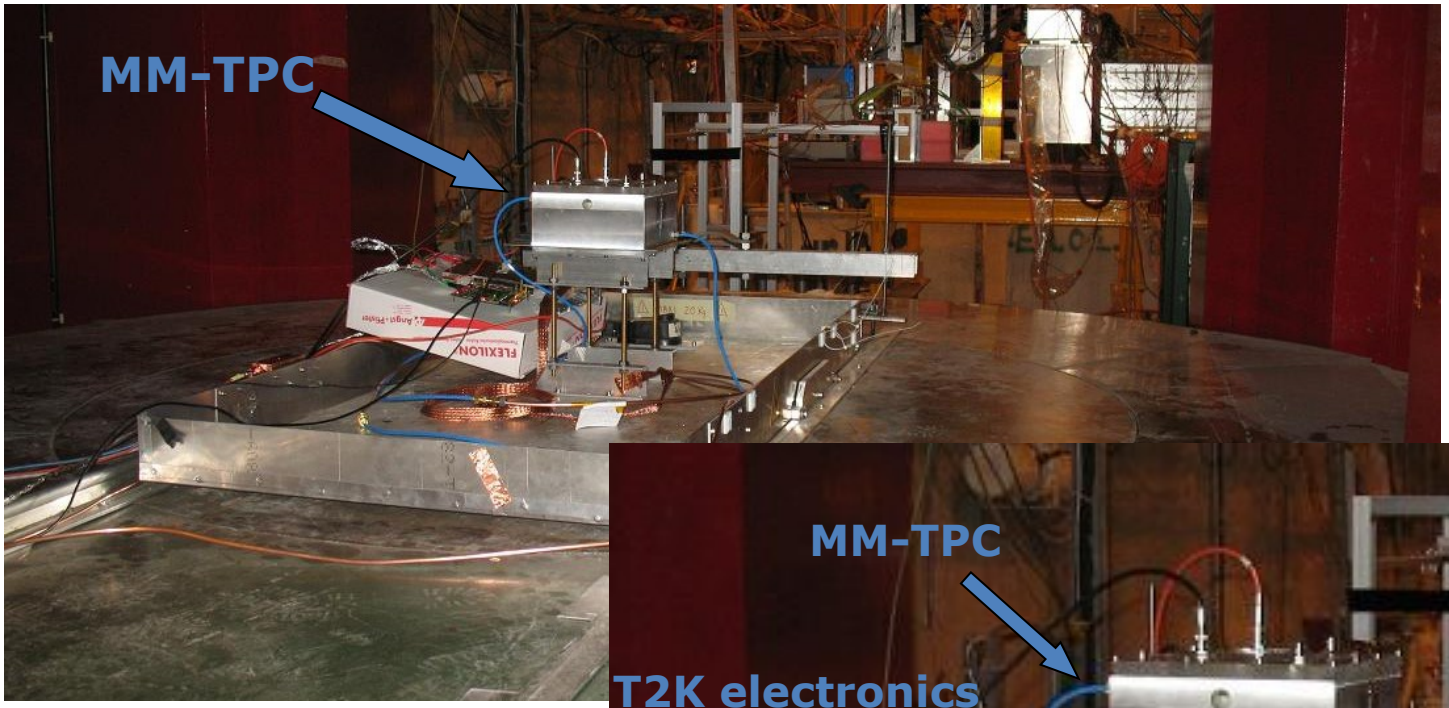
The Micromegas TPC prototype test setup at Saclay

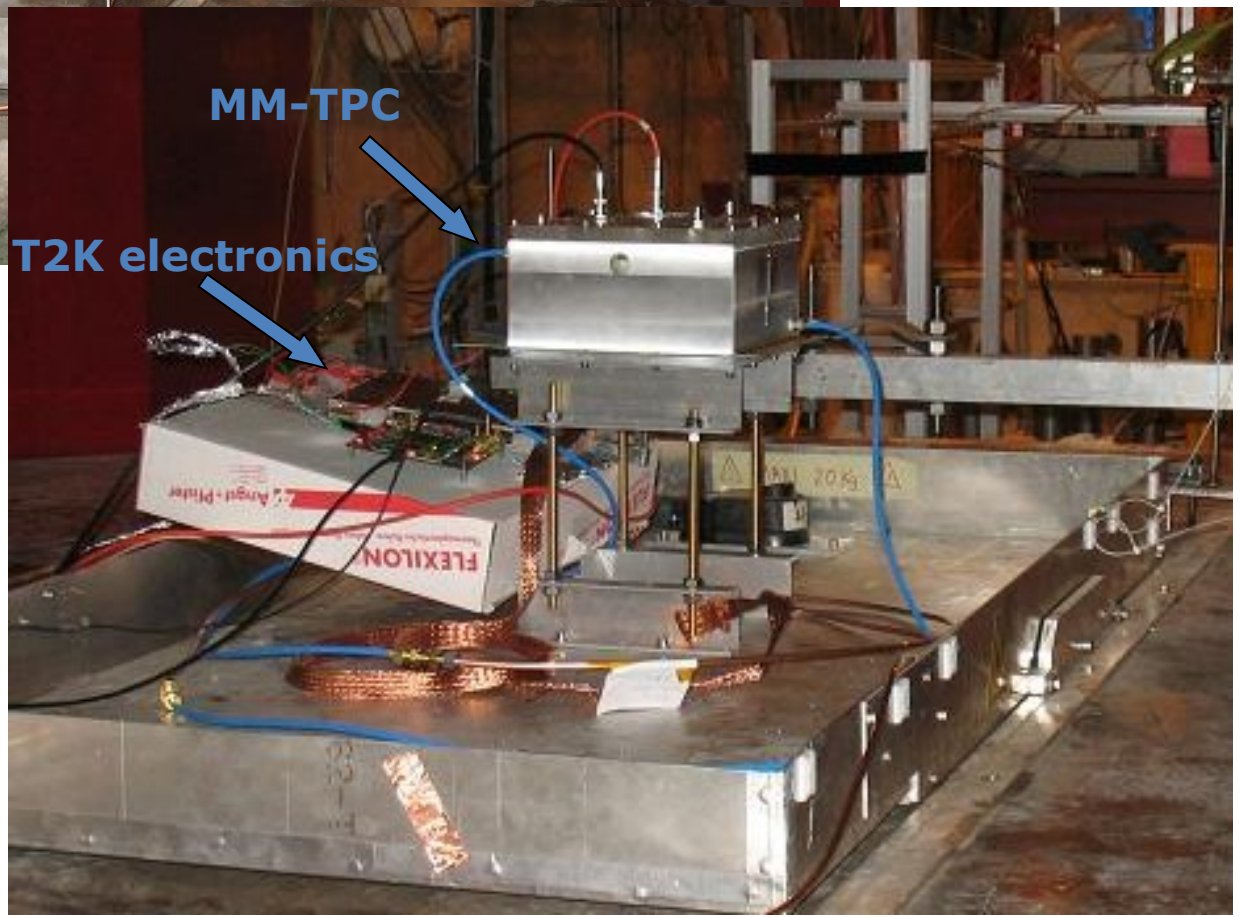


The new X-Y Micromegas readout board design



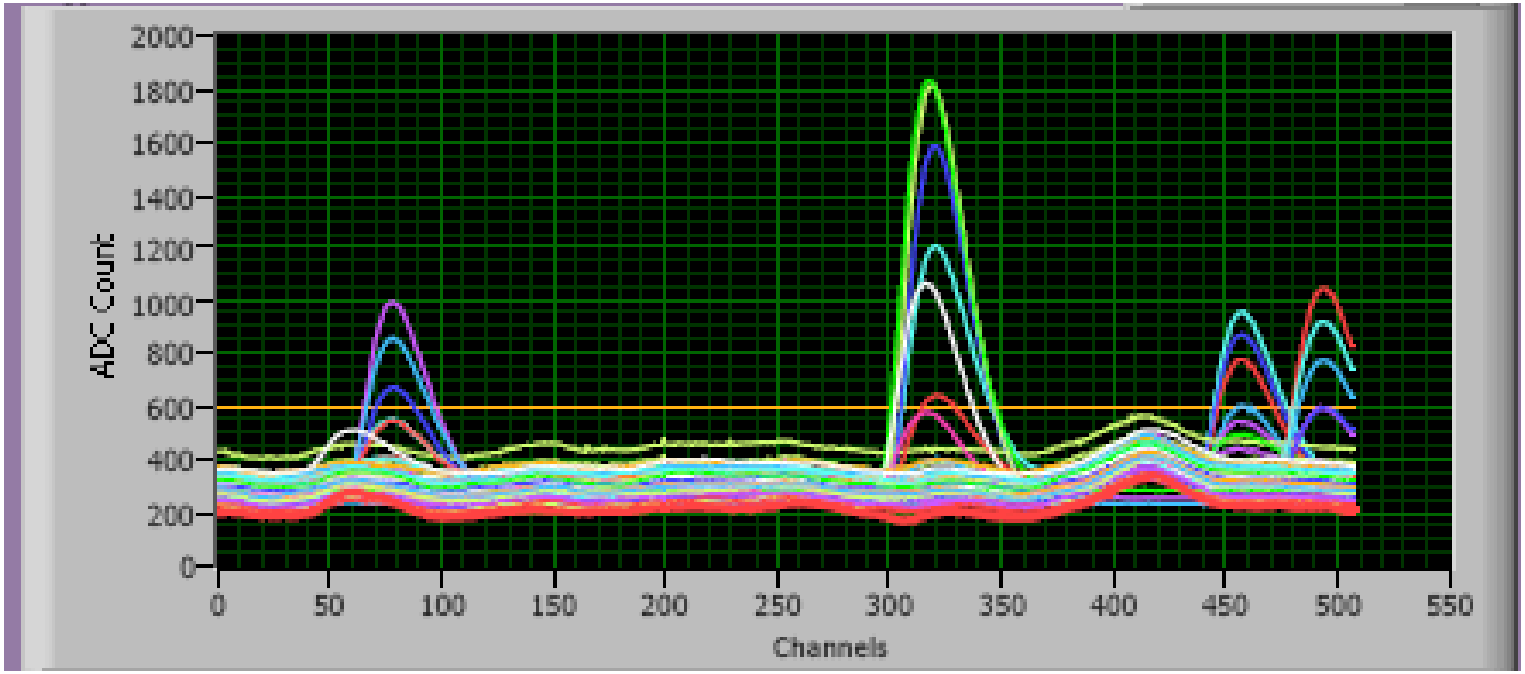
Based on MIMAC's Saclay design modified and constructed by Rui's lab at CERN





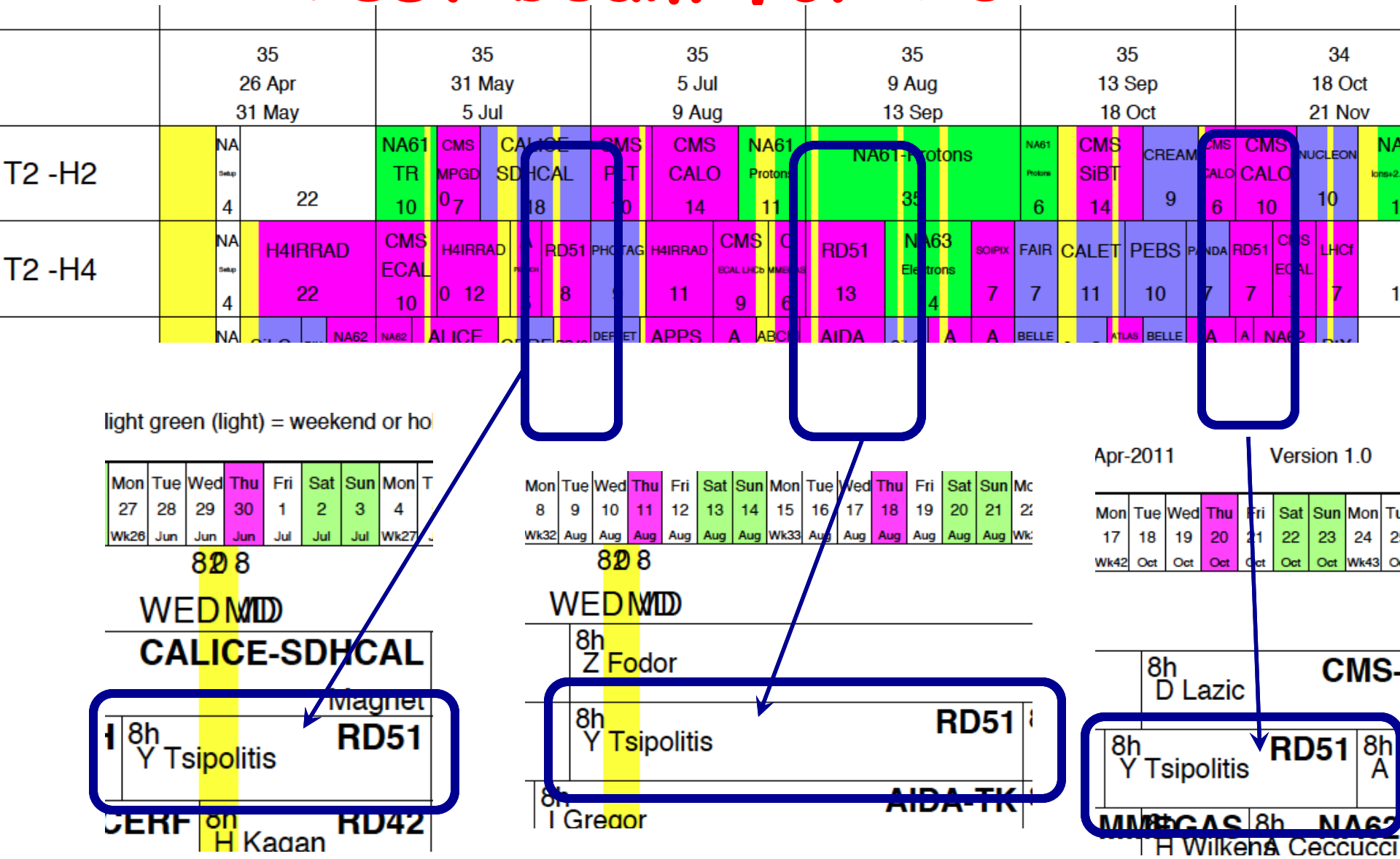
Inside Goliath

pions seen by the MM-TPC during October 2011 RD51 test beam



- **The MM-TPC can function in muon beams and low intensity hadron beams**
- **Noise should be further reduced to be able to self trigger on pure events**
- **Intense tests of the different available data acquisition system are needed before we go back for further and more detailed beam tests.**
- **A very useful proof of principle has beam accomplished in last years October RD51 test.**

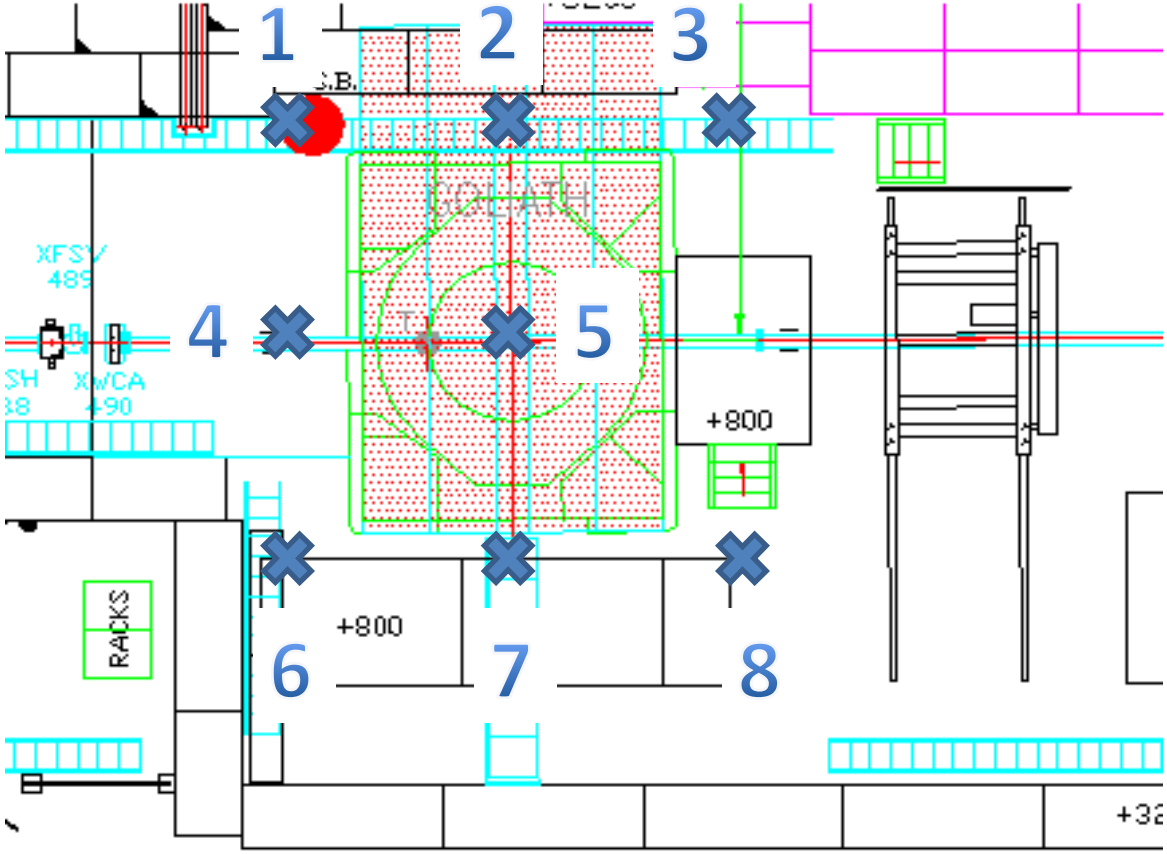
Test beam for 2011



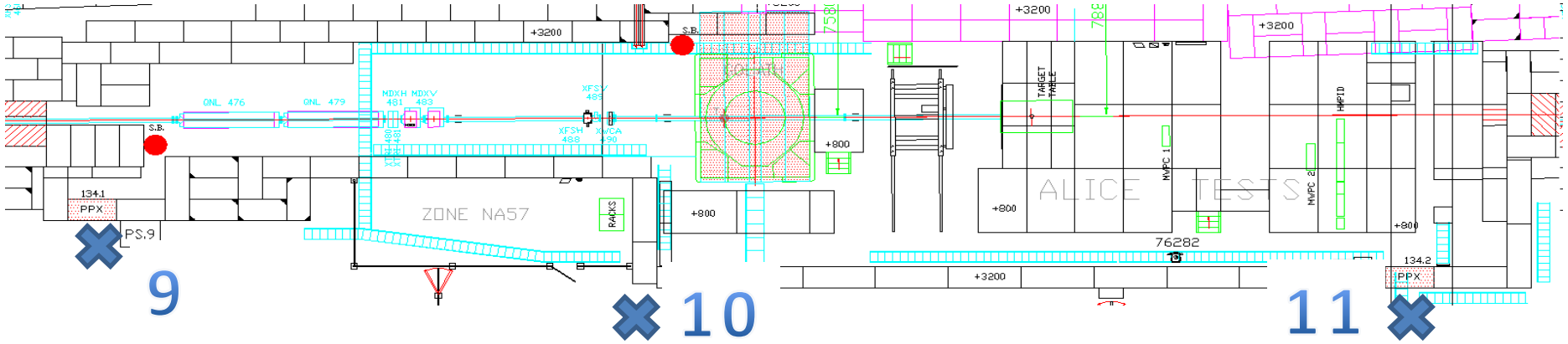
Test beam requests for 2011

- We have 9 groups that will participate in the 2011 RD51 Test Beams
  - 1st period : 3 groups
  - 2nd period : 6 groups
  - 3rd period : 9 groups

Fringe magnetic field has been measured in several point in the area..



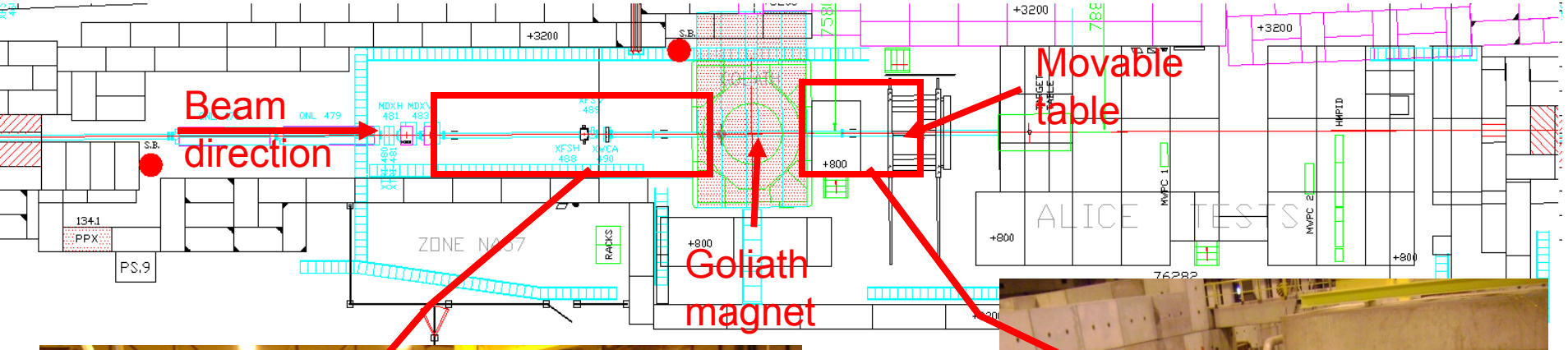
.. and in the corridor just outside

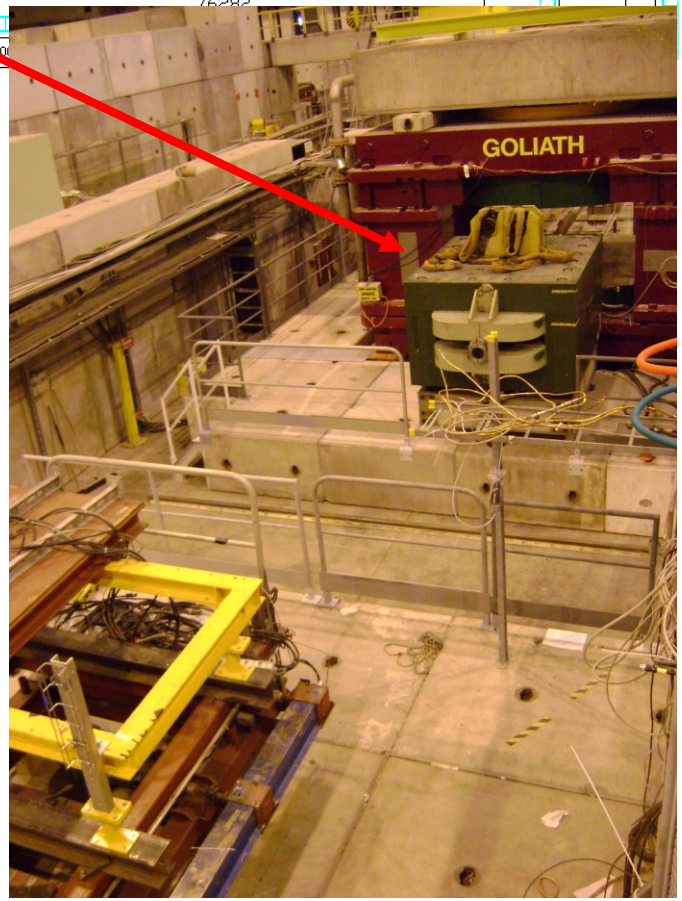


Measurement Map

Point	Half Current	Maximum Current
1	0.0005 T	0.007 T
2	0.0004 T	0.010 T
3	0.0005 T	0.007 T
4	0.005 T	0.011 T
5	0.868 T	1.518 T
6	0.0003 T	0.006 T
7	0.0009 T	0.009 T
8	0.0004 T	0.008 T
9	0.0001 T	0.0001 T
10	0.0001 T	0.0011 T
11	0.0001 T	0.0004 T

Changes at the Area

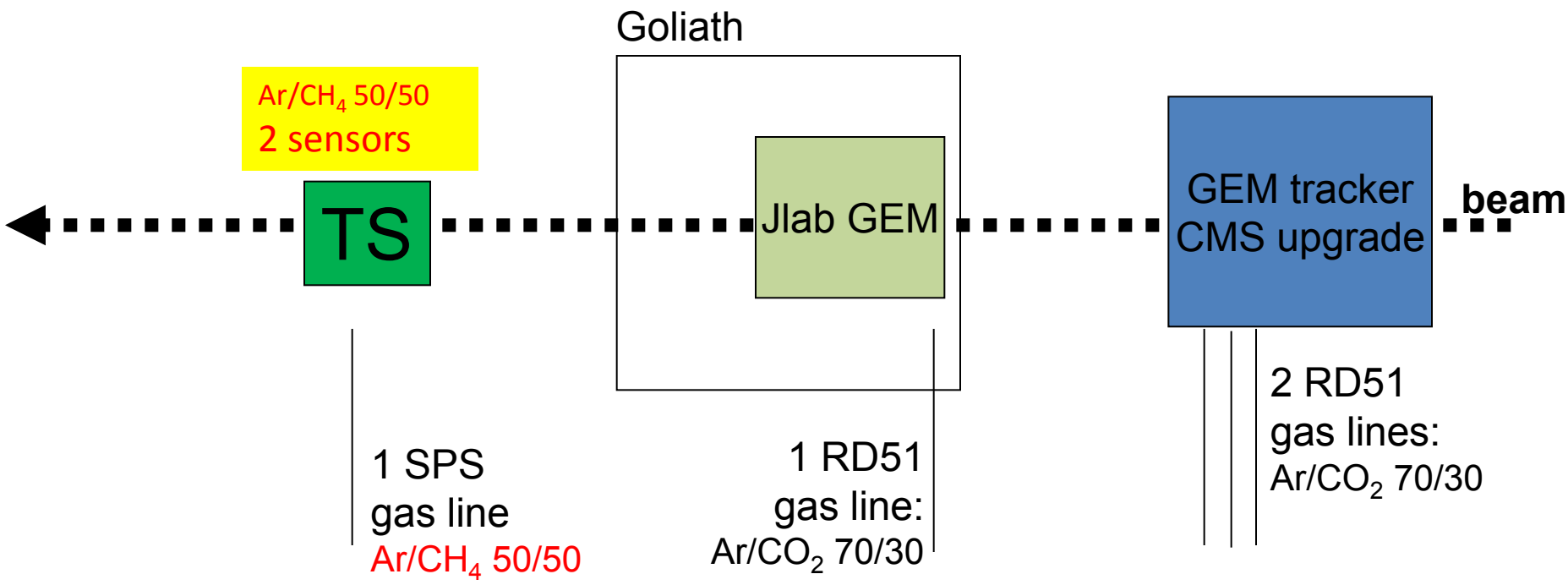




New Cables

- New patch panels from control room to the area:
  - 36 connectors type SHV
  - 60 connectors type BNC
  - 10 connectors type Rj45
  - 5 connectors type Subd9
  - 2 connectors type Subd9 (Profibus)
  - 3 connectors type Burndy 12, 19 & 28 pins

Period 1 (June 27th – July 5th)



Organization

- It would be nice if each group has one contact person for the test beam since it facilitates the communication.

Conclusion

- We are ready for one more year with lots of fun in H4