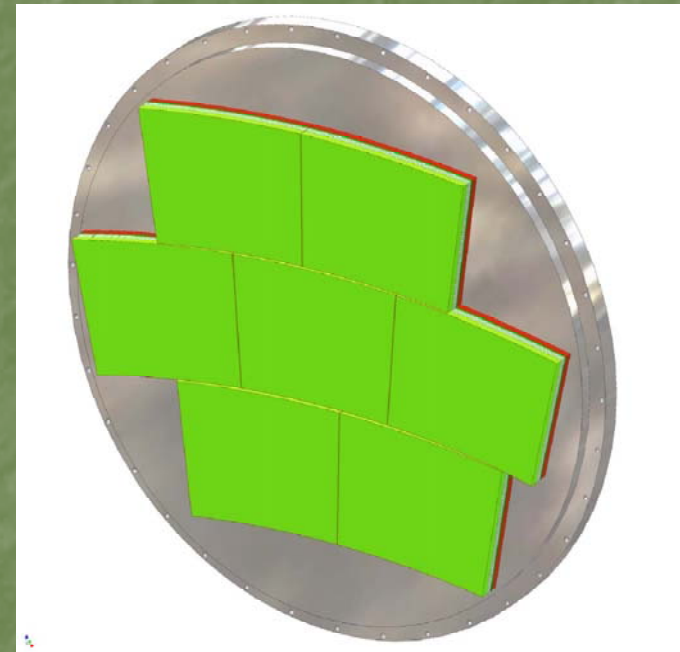


Micromegas TPC R&D

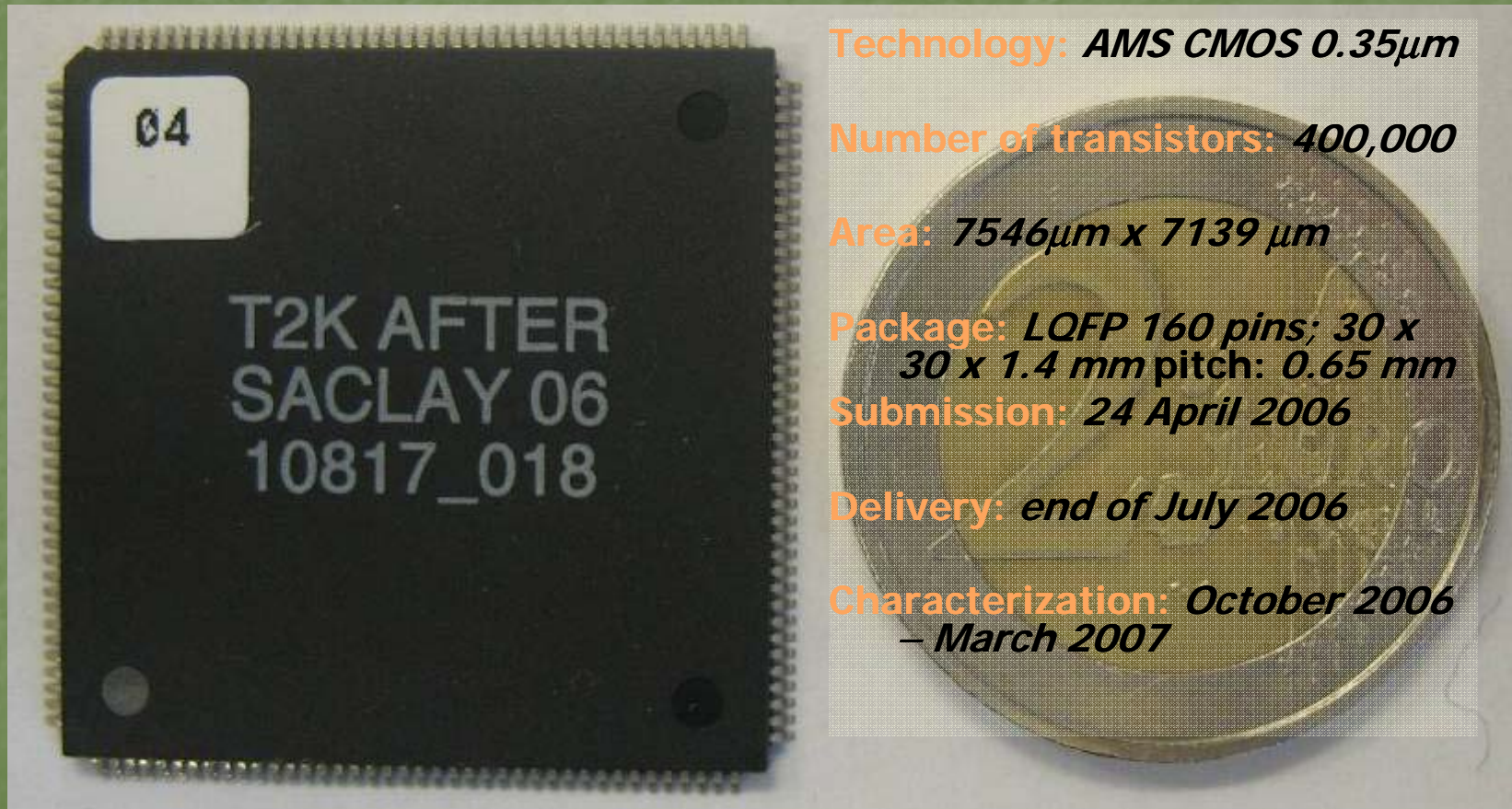
Panels for the Large Prototype
and recent T2K cosmic-ray tests

Plans for Micromegas Panels

- Resistive anode from the start
-> resistive "bulk"
- Use of T2K electronics
- Mock-up of the mechanics under construction, according to Cornell design (D. Peterson)
- Several solutions for the resistive layer and the mesh



AFTER



Technology: AMS CMOS 0.35 μ m

Number of transistors: 400,000

Area: 7546 μ m x 7139 μ m

Package: LQFP 160 pins; 30 x 30 x 1.4 mm pitch: 0.65 mm

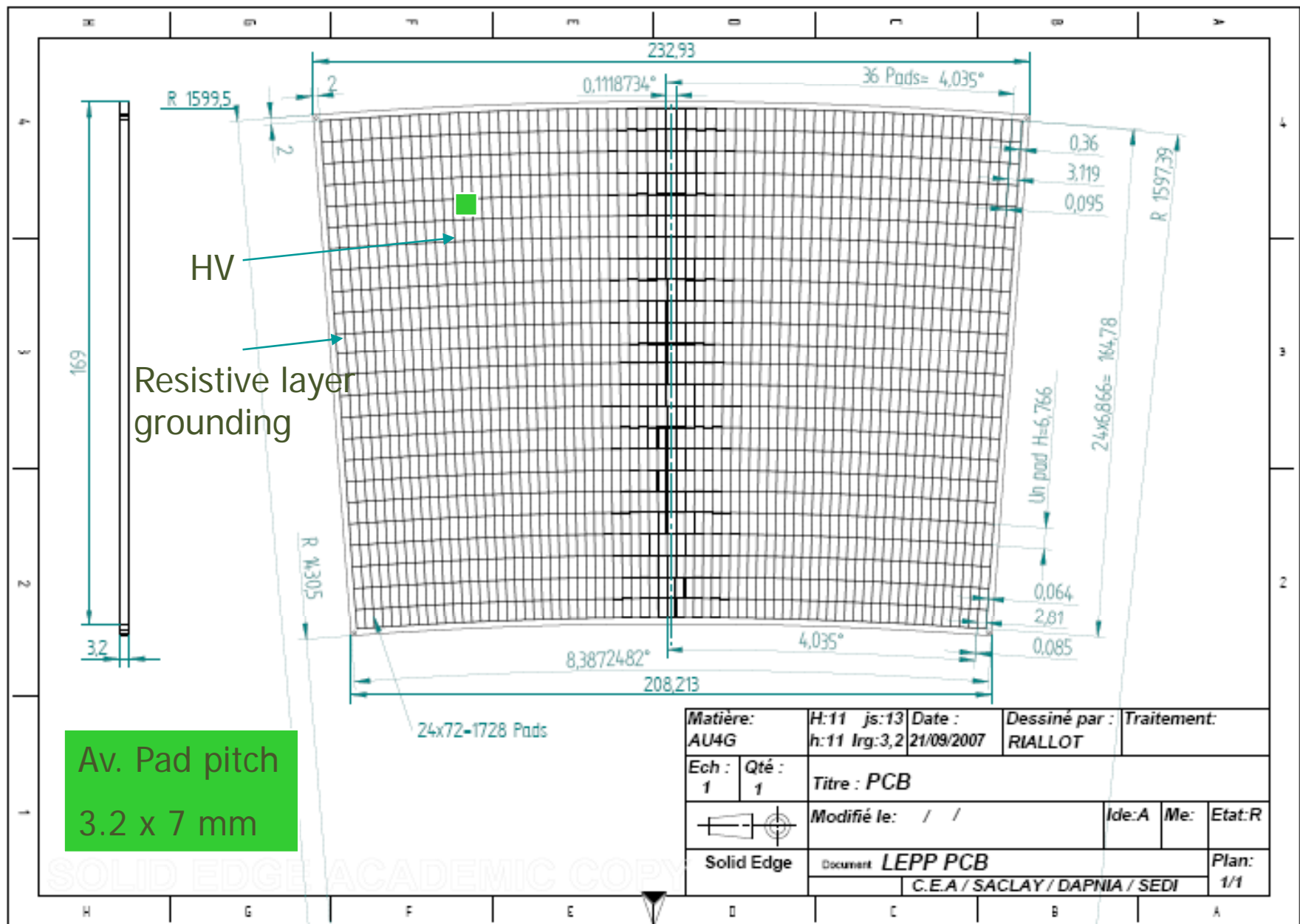
Submission: 24 April 2006

Delivery: end of July 2006

Characterization: October 2006
– March 2007

AFTER-chip based readout

- The most compact at present: 72 channels
- Very flexible : 10 to 100 MHz sampling, shaping: peaking time from 90 to 800 ns, can be switched off, zero suppression.
- Production decided last October 12. Will take place in Q3 2008 (140 000 channels for T2K, 14000 for LC-TPC LP)

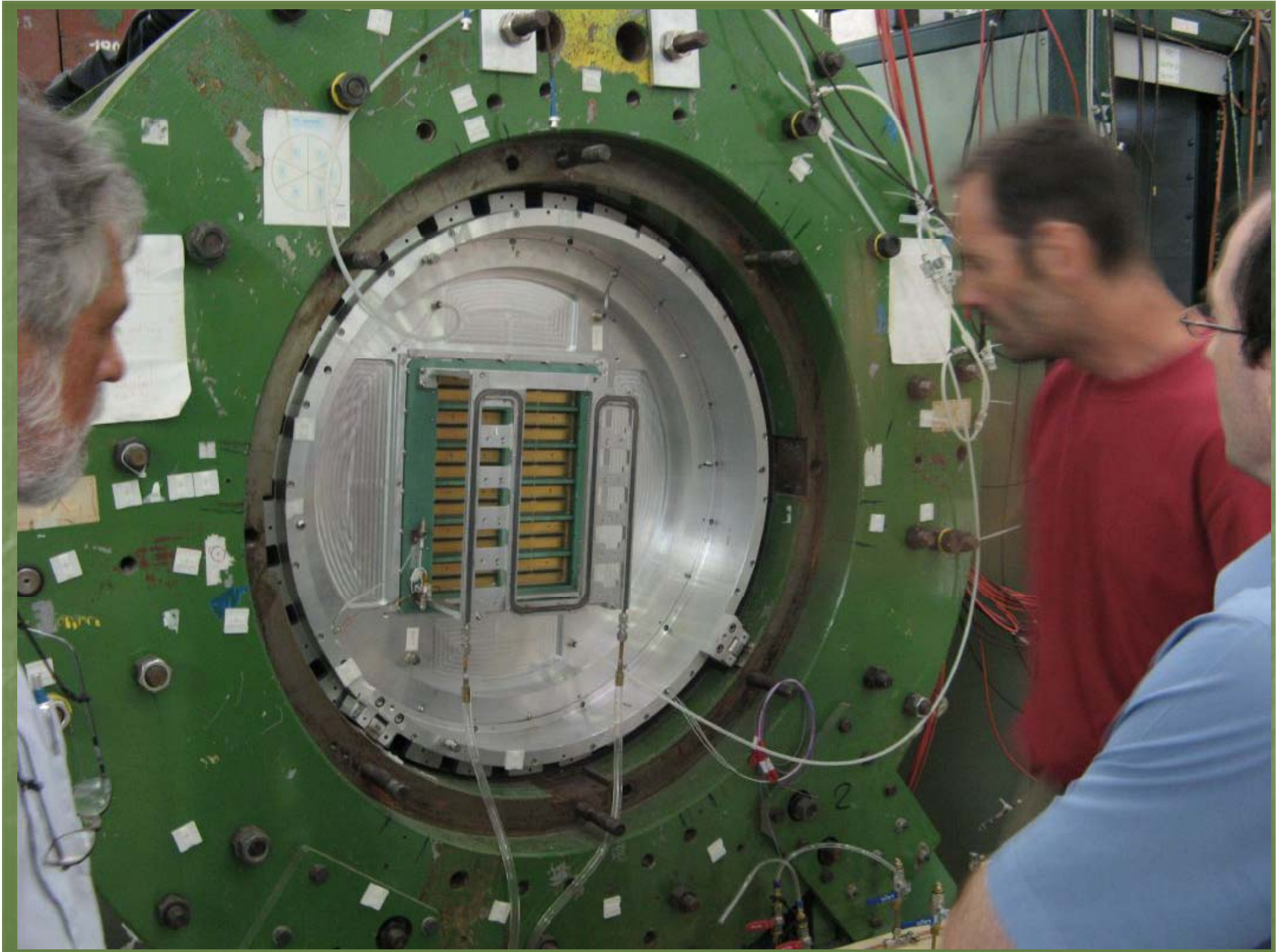


Schedule (tentative)

- Nov. 10: mock-up in Al., position connectors
- Nov. 30: cover PCBs with resistive layers
- End of december : get panel+mesh (bulk)
- March : cosmic tests at DESY.

T2K tests at CERN Sept-Oct 07

- Just completed, with one 1728 pad panel (bulk technology, no resistive layer), equipped with AFTER-based readout
- Fully engineered, cooling operational
- Zero suppression on the mezzanine card, not fully operational at the time of the run
- Very successful (500 000 cosmics, 10000 beam data)
- Data taken at $B=0.2, 0.4$ and 0.7 T, peaking time of 200ns and 400ns with Ar-CF₄-Isobutane

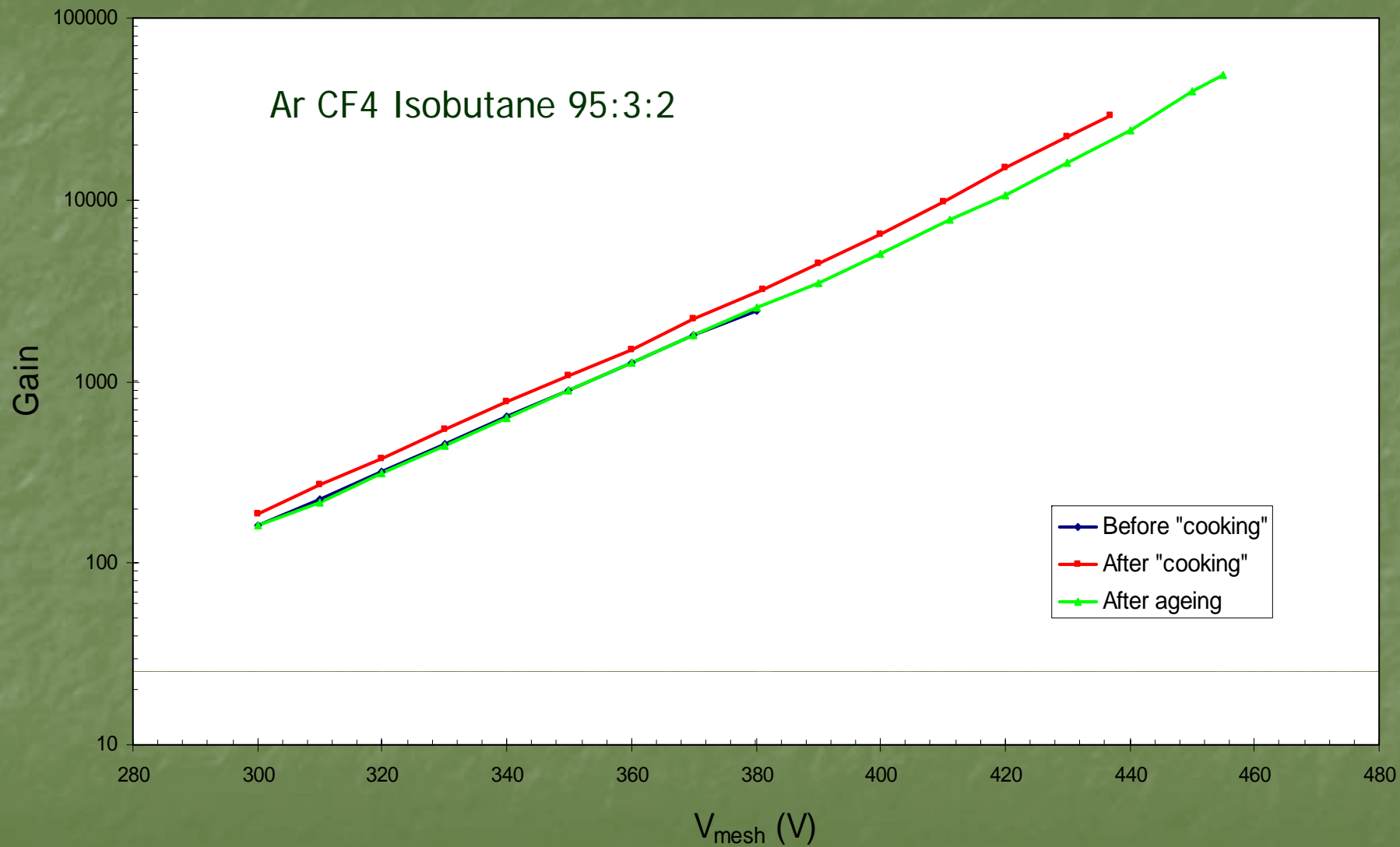




ALCPG07, Fermilab,
2007-10-23

Bulk detectors are now very stable. Gains up to 60000

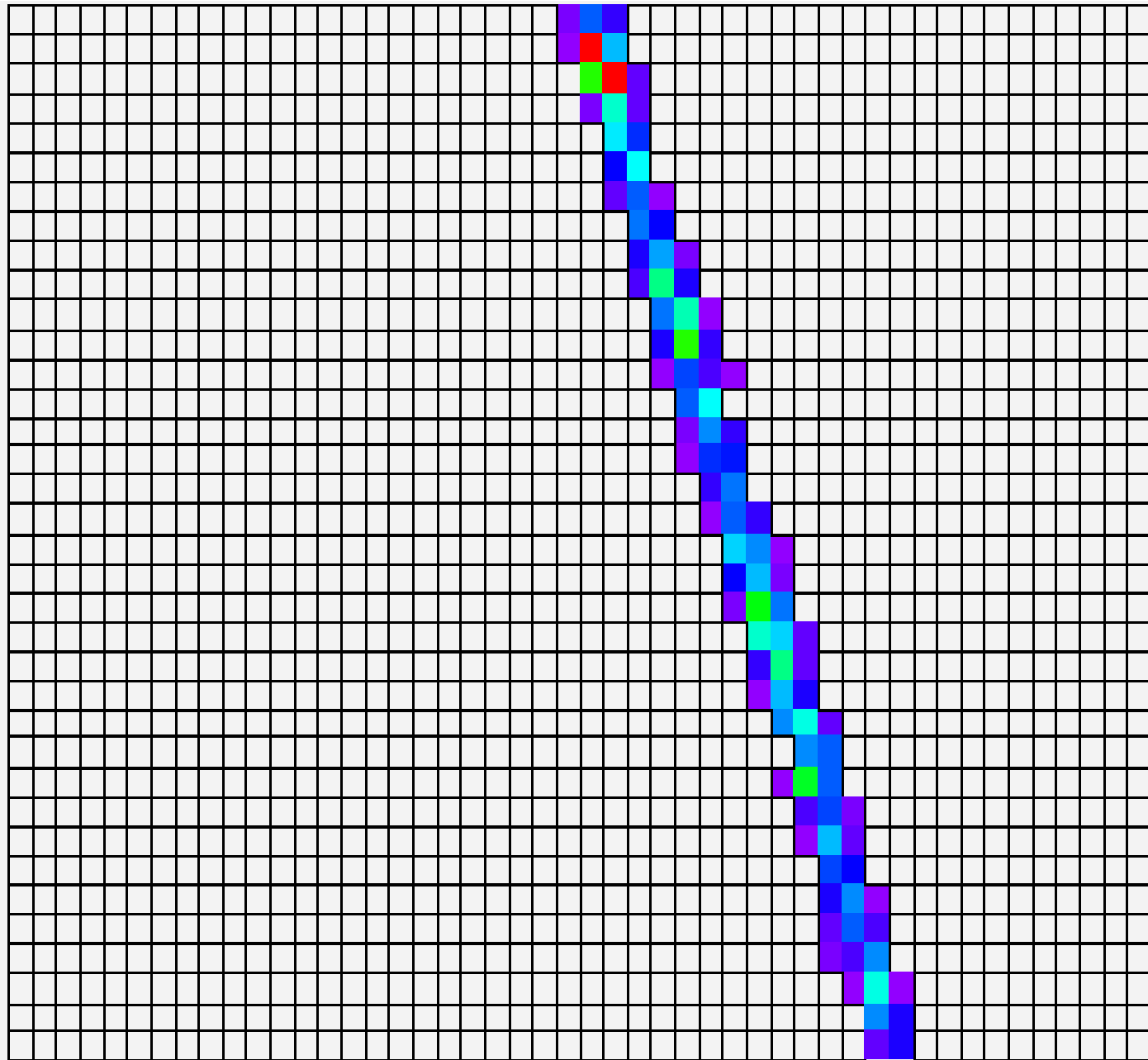
But run at 700-800

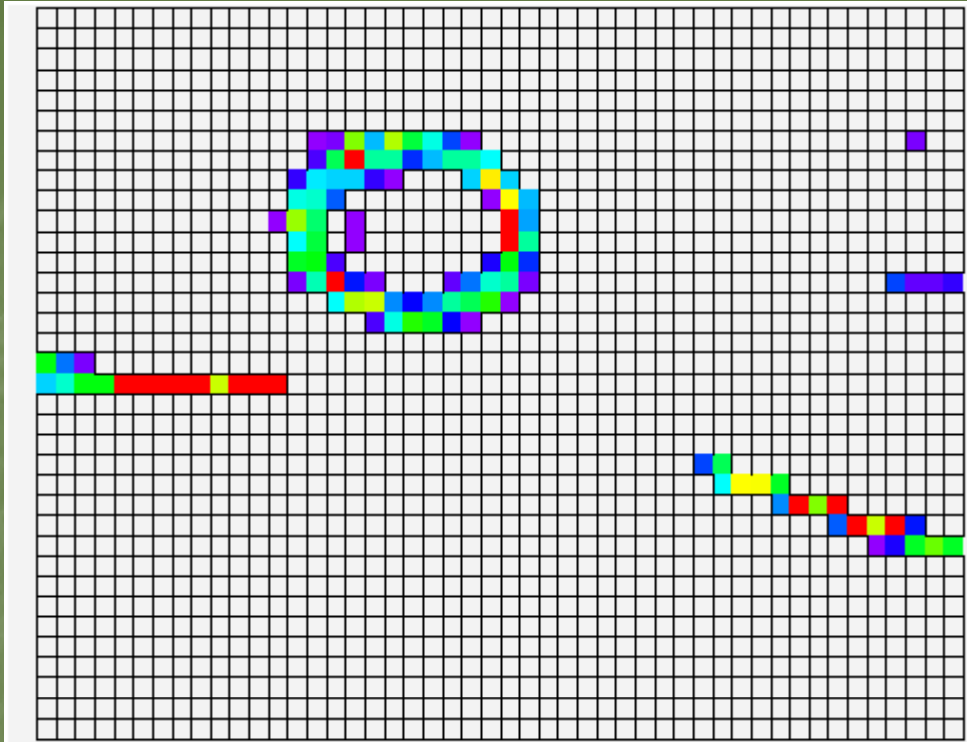


36x34 cm²

1728 pads

Pad pitch
6.9x9 mm²





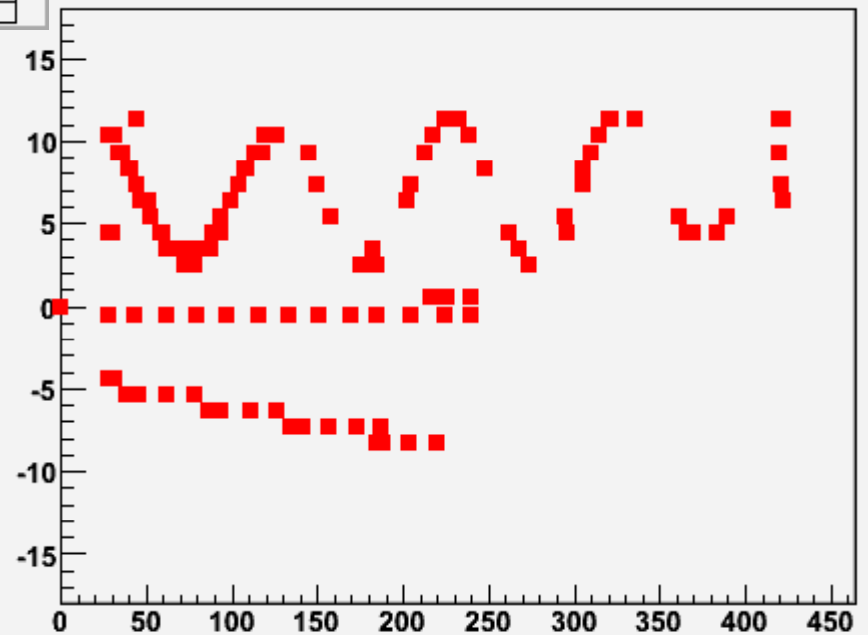
Gain about 800 !

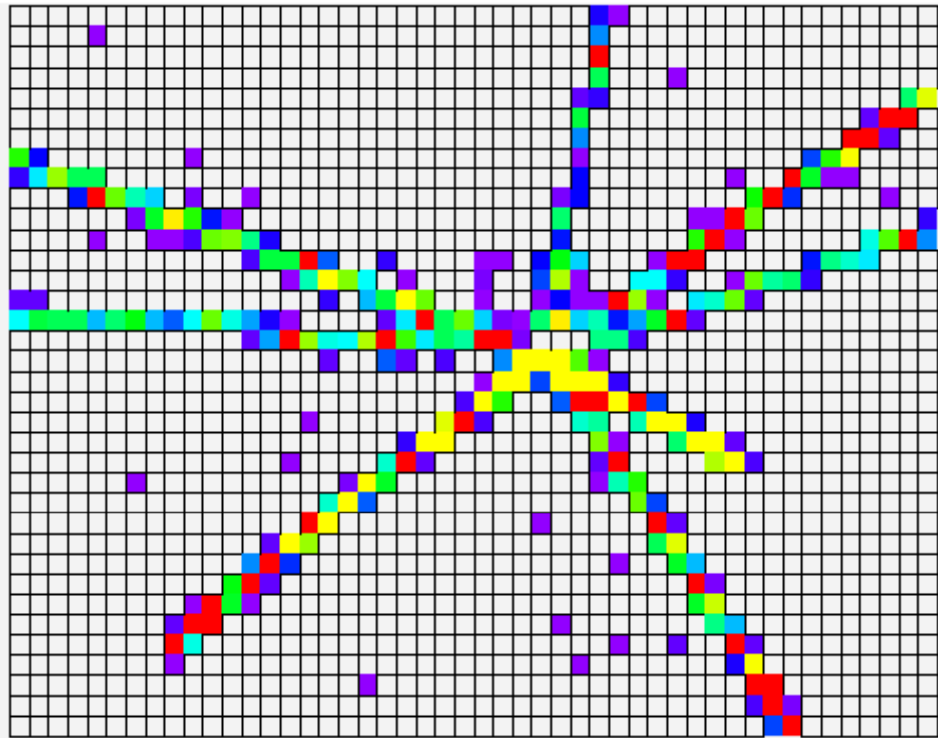
1 'spark' (100 nA) per 10 hours without beam.

ALCPG07, Fermilab,
2007-10-23

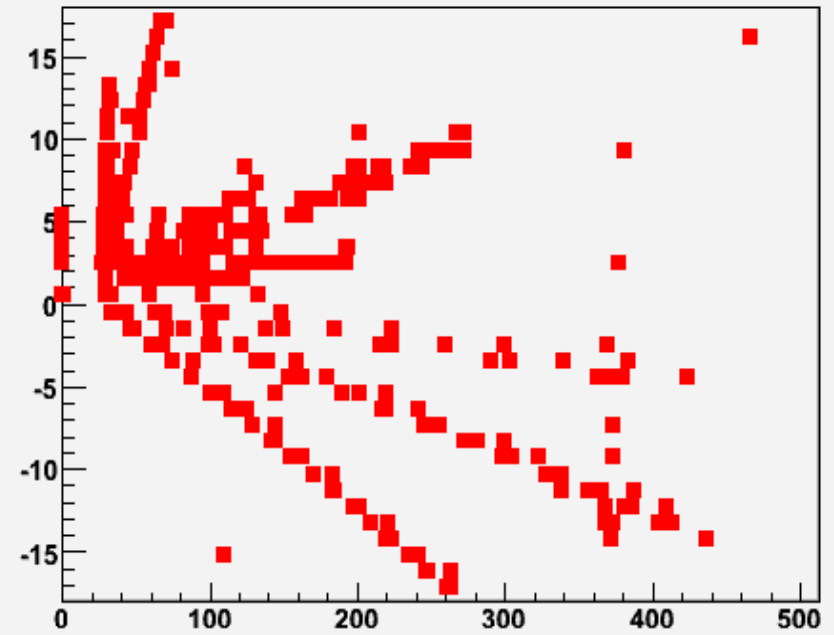
P. Colas - Mic

time bin (50 ns tick)



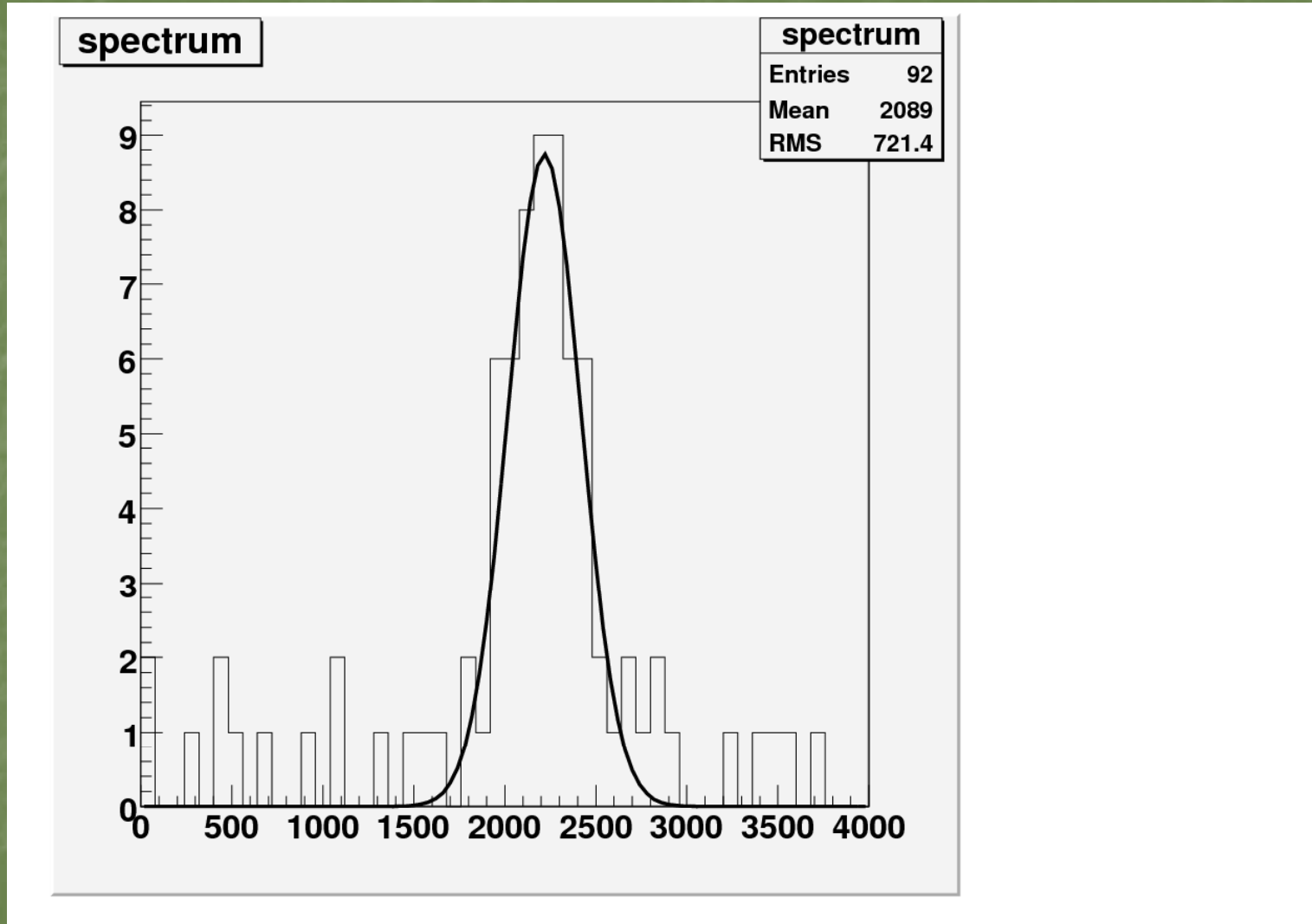


Y vs time bin (50 ns tick)



Monitoring with a ^{55}Fe source

9 % rms resolution.



Options for the resistive anode:

Carleton-CERN-Orsay-Saclay... + others R&D collaboration towards a resistive 'bulk' Micromegas.

- Resistive film (AlSi cermet) on mylar+glue
- Resistive paste (under test at CERN)
- Thin film deposition on PCB or kapton or other (project at Neuchatel)

Electronics

A second full set with spare is being assembled for the LP test at DESY (1700 channels) : available mid-November 2007.

Full production of chips mid-2008.

CONCLUSION: we can be ready in less than 2 years with a complete realistic design. Then more R&D needed to improve integration of electronics on the board.

Conclusion

- A Micromegas TPC Large Prototype should be ready (on time and on-budget, without complying with DOE order 413.3) :
 - 1 central panel + 6 dummy in March 2008
 - 7 fully equipped panels in 2009
 - 1 panel capable of receiving 8 TimePix chips should be available end of 2007.