

Omega

CALICE/EUDET FEE

status

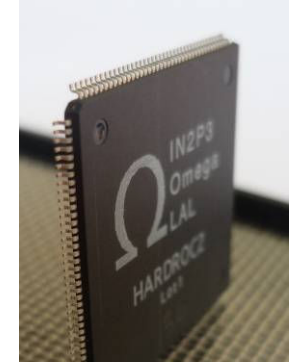
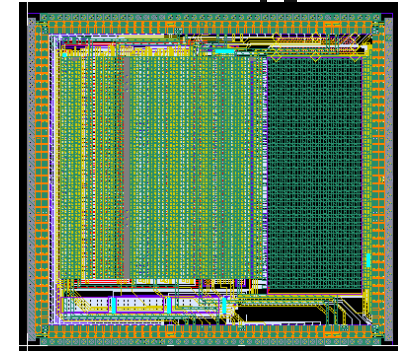


LA TAILLE

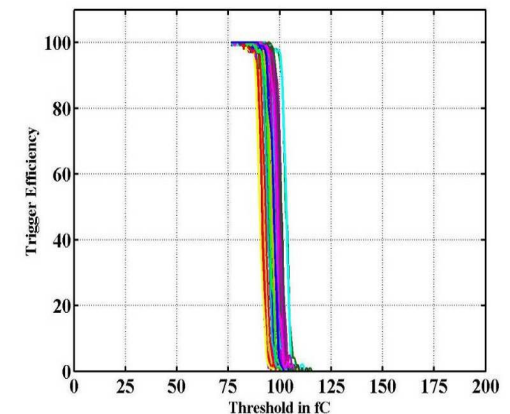


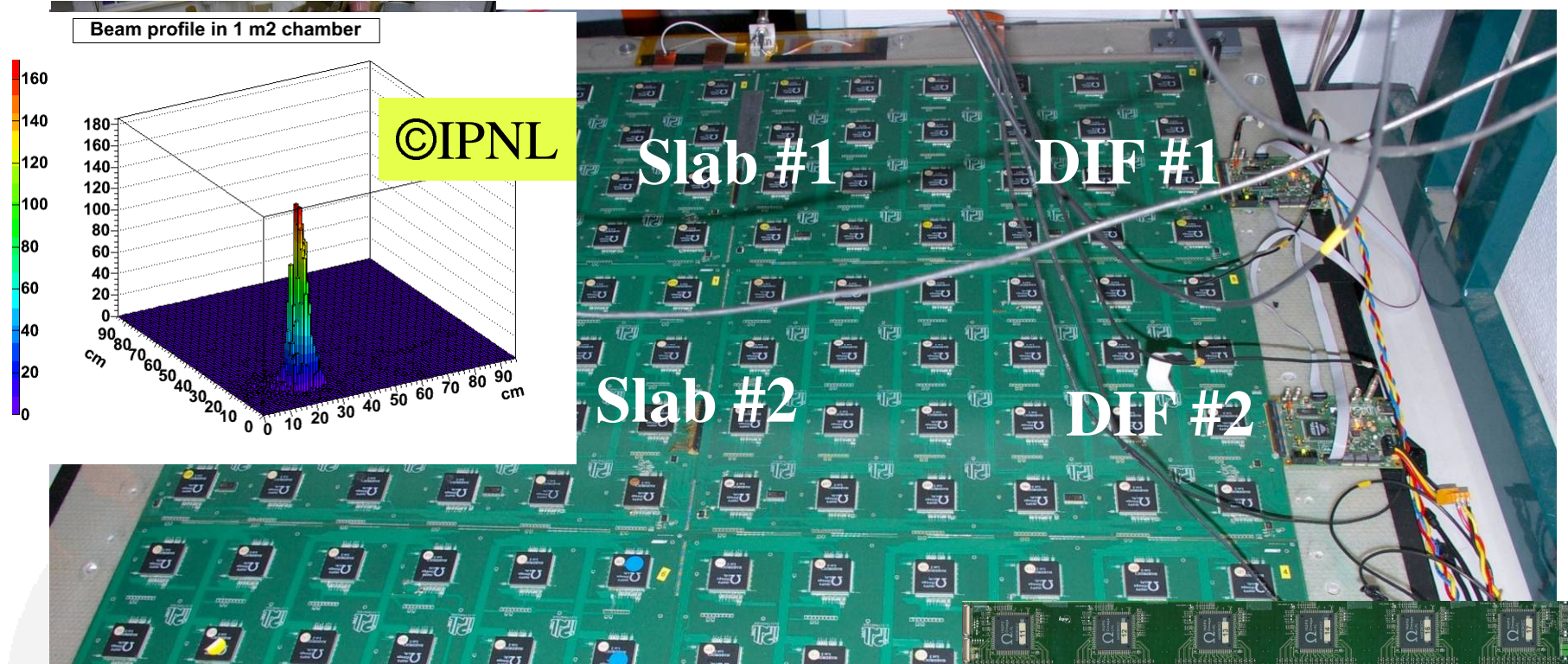
Orsay MicroElectronic Group Associated

- 400 chips HARDROC2 produced in june 2008 to equip 24-chip RPC and Micromegas PCBs for square meter
 - 3 thresholds (0.1-1-10 pC)
 - Power pulsed to 5-8 $\mu\text{W}/\text{ch}$
 - Package TQFP160
 - **Some difficulties loading Slow Control : SOLVED in HARDROC2B**
 - **Readout and DAQ2 validation**
- 200 HARDROC2B received in dec 09
 - Ready to equip one RPC prototype
 - Final for production : see PRR tomorrow
- Full production run: in 2010
 - See talk by N. Seguin-Moreau



TQFP: t=1.4 mm

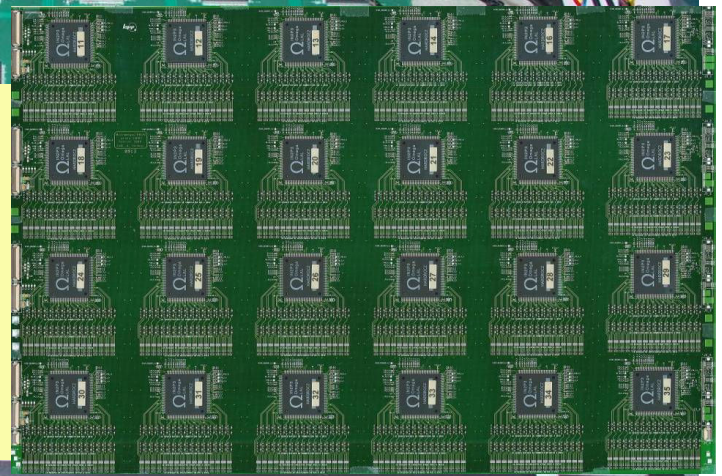




Fully equipped large scalable detector tested in cosmic rays bench and in test beam at CERN in **summer 09** [I. Laktineh et al.]

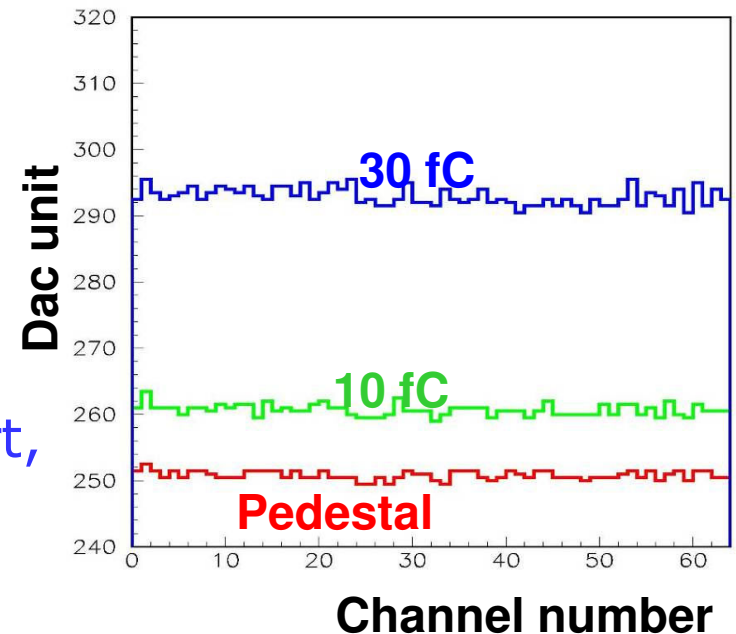
Similar development with μ MEGAS [C. Adloff et al.]

A NICE PROOF of INFRASTRUCTURE

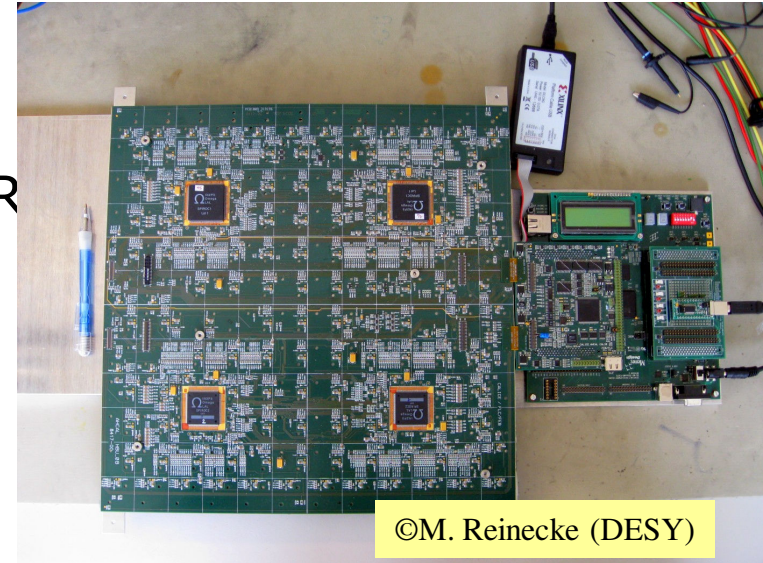


Remaining issues

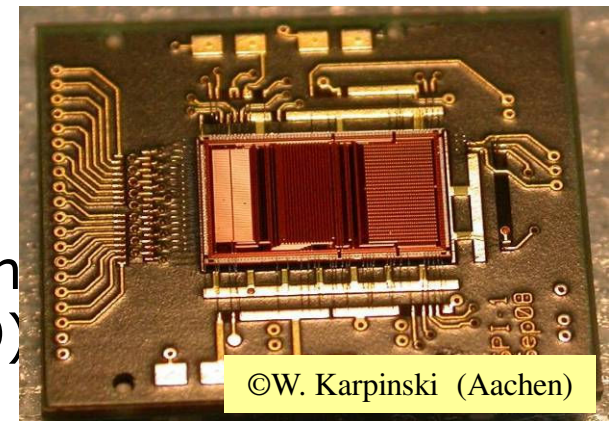
- Full detector test with power pulsing
 - Tests on going at Lyon
- Not optimized for micromegas
 - Late information on signal amplitude and speed (150 ns)
 - => Thresholds around 2 fC
 - => slower "fast" shaper needed
 - => High voltage protection
 - Needs charge preamp
- Performance with detector :
 See talks by C. Combaret, C. Drancourt,
 H. Mathez,



- 50 chips **SPIROC2** produced in june 2008 to equip AHCAL and ECAL EUDET modules
 - **Fulfilled EUDET milestone**
 - Package TQFP208 (w=1.4 mm)
 - Difficult slow control loading (cf HR)
 - Measurements (slowly) coming in
 - Complex chip
 - Collab LAL, DESY, Heidelberg
 - See talk by M. Reinecke



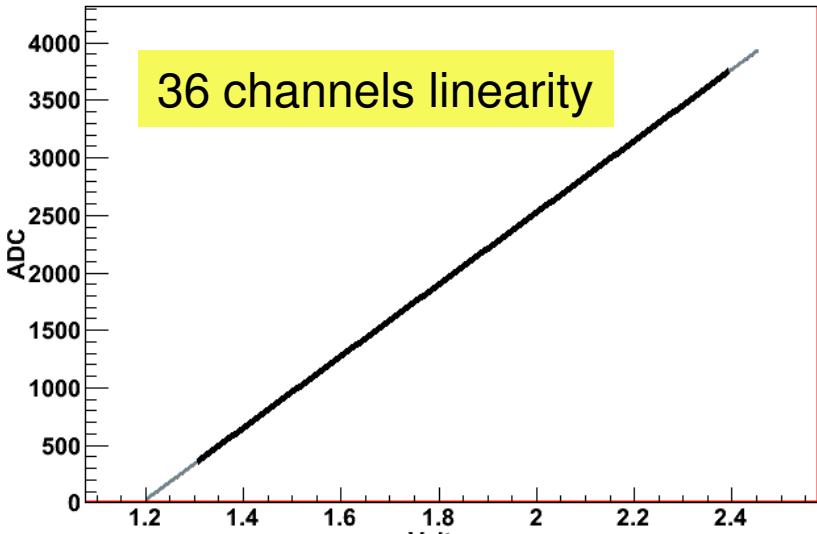
- External users :
 - astrophysics PEBS (Aachen), medical im
Pisa, Valencia...), nuclear physics (IPNO)
(Napoli)



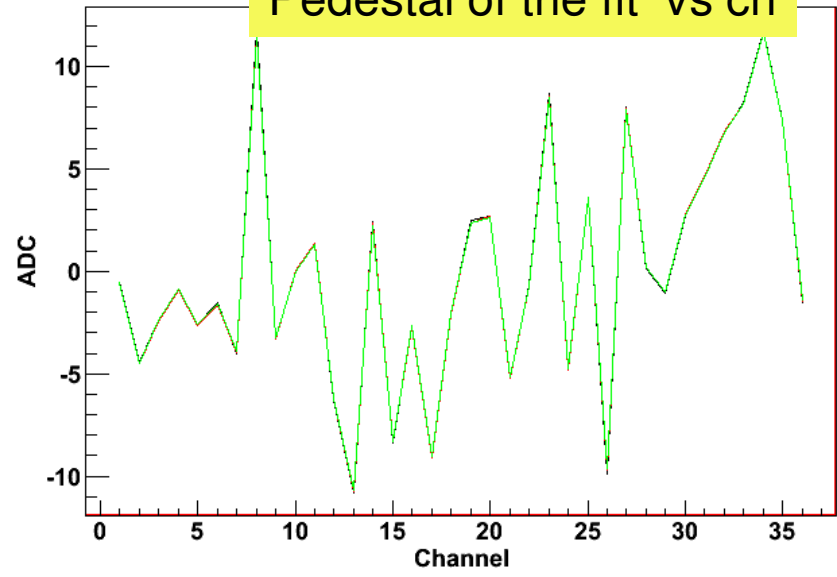
Internal 12-bit ADC performance



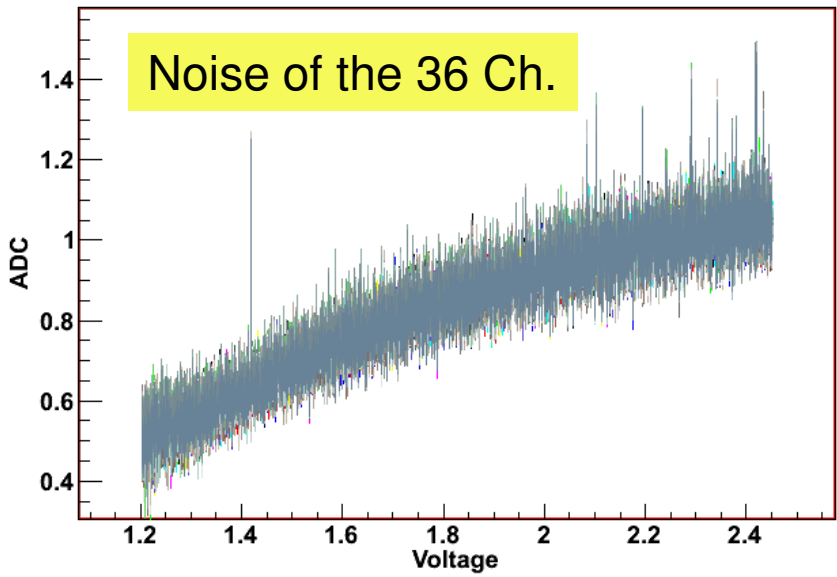
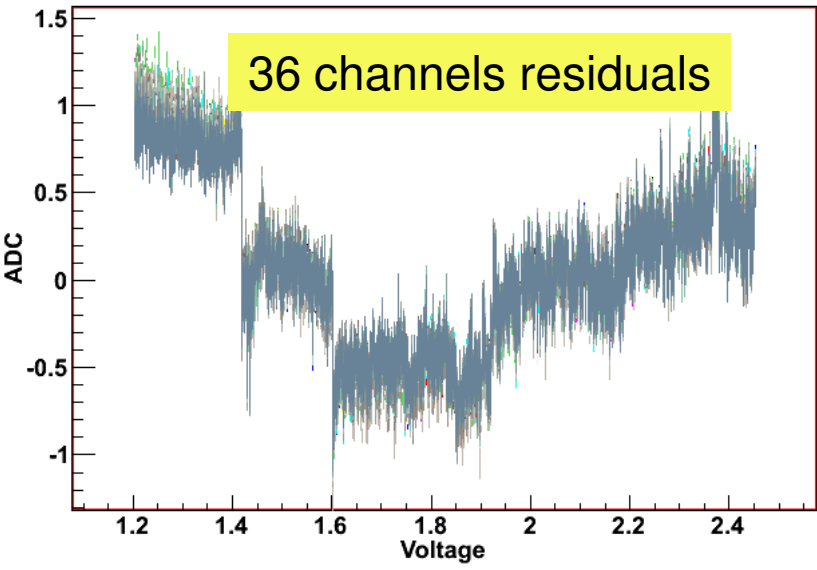
Mean(Voltage)



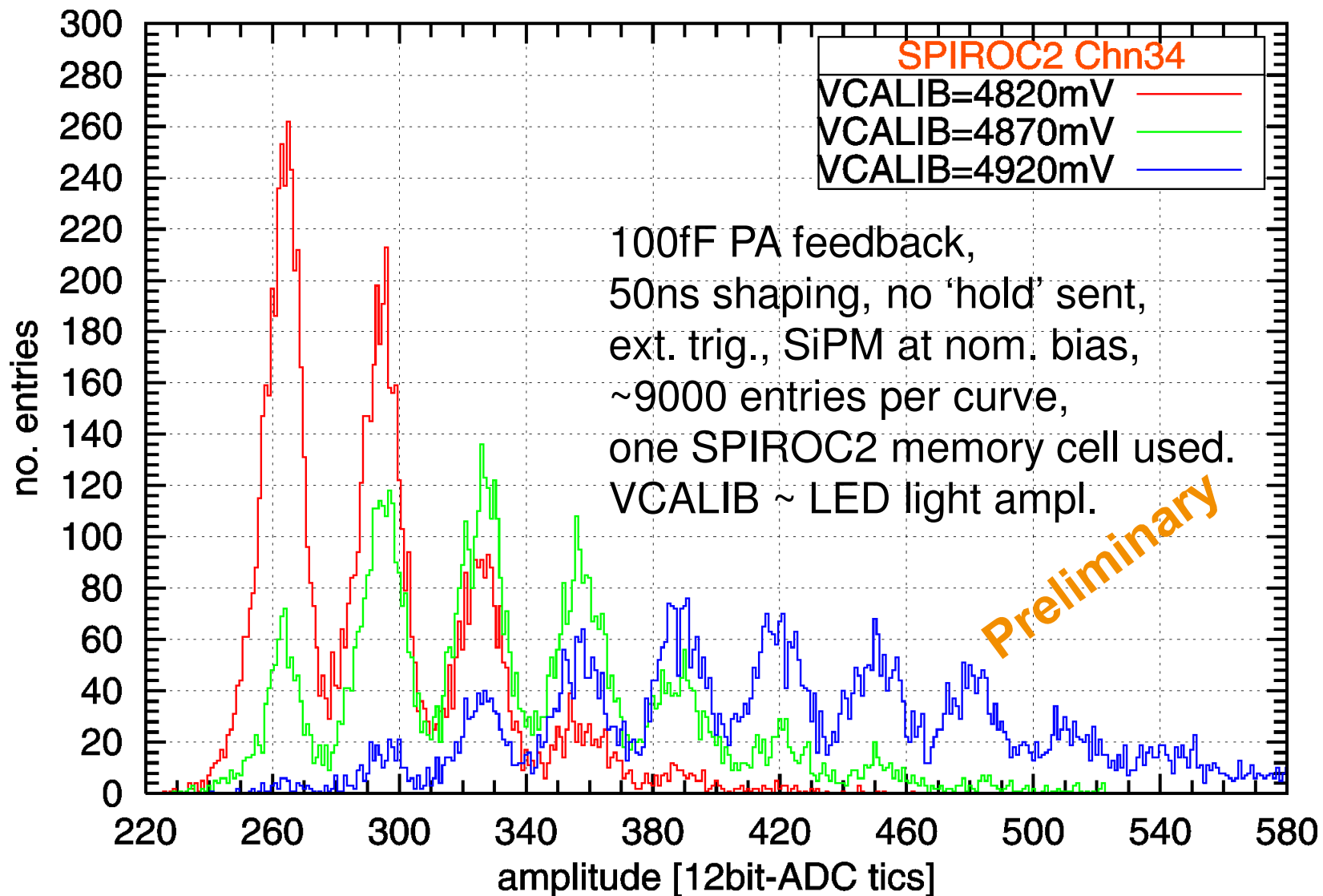
Mean(Channel_relative)



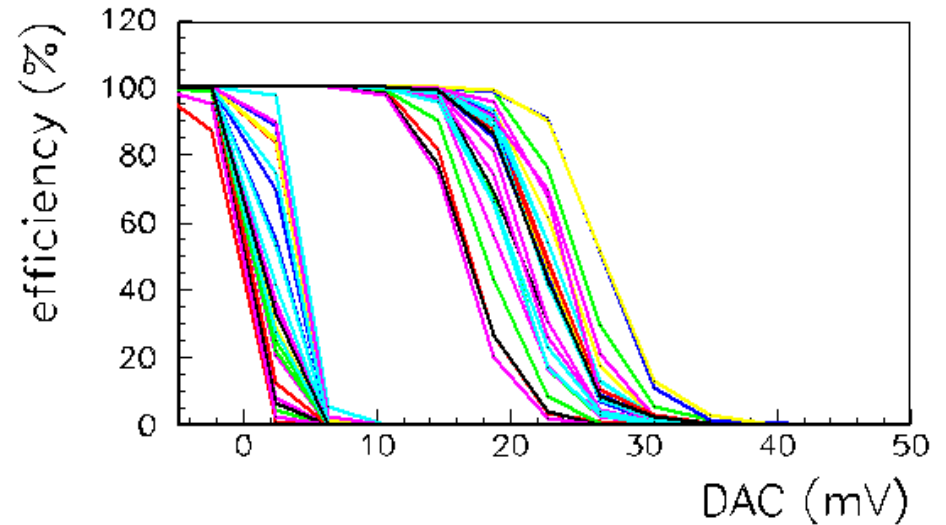
Residual(Voltage)



Single-Photon Peaks I

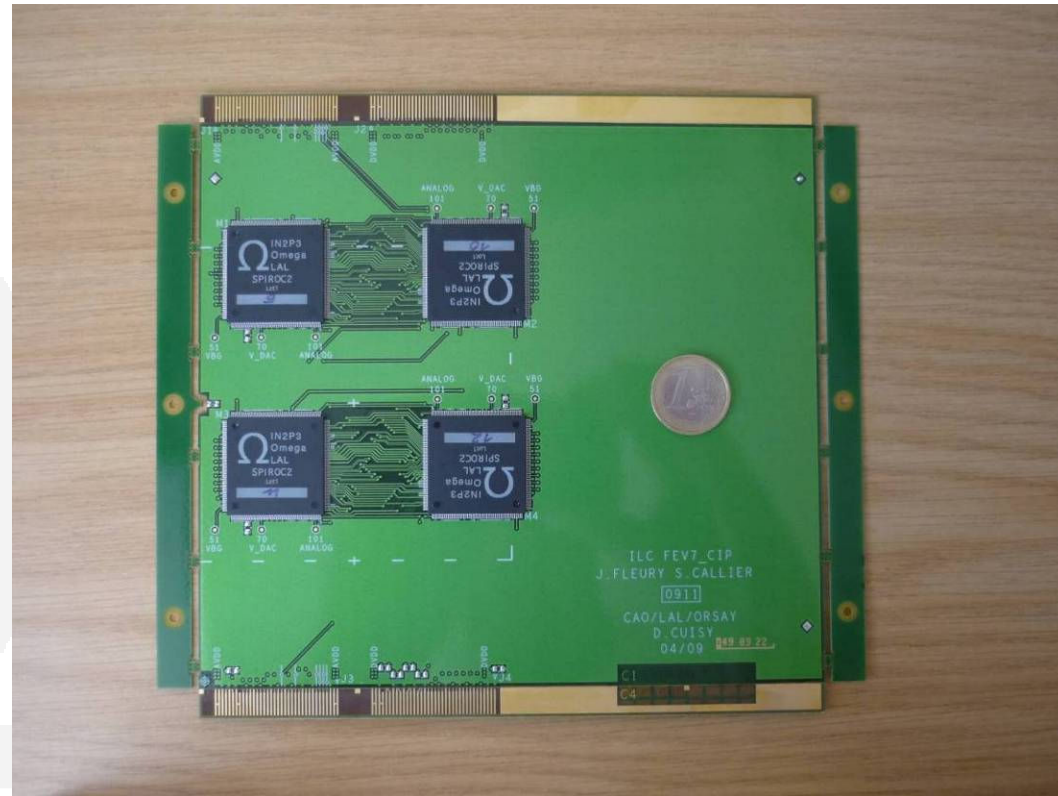


- Autotrigger mode
- Linearity
 - Tests by Riccardo
- Power pulsing
- Time measurement
- 2 versions will be submitted (see talk by L. Raux)
 - SPIROC2A
 - SPIROC2B

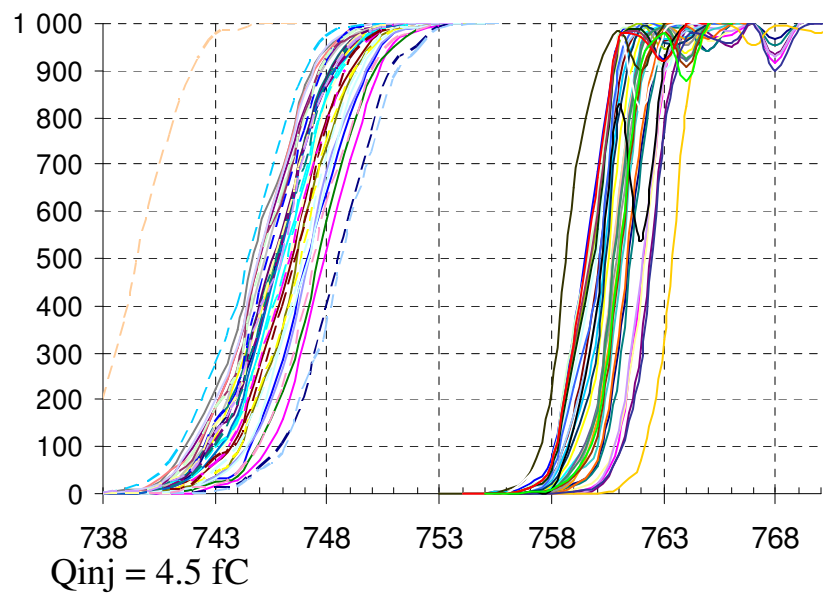
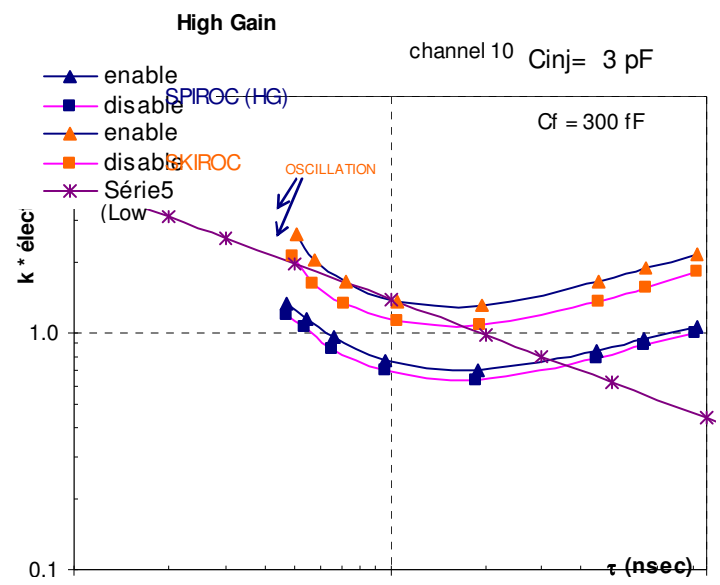


- SKIROC1 useless with detector (no readout)
- SPIROC2 used as SKIROC emulator
 - 95% identical to SKIROC (only preamp differs)
 - 36 channels instead of 64
 - Limited dynamic range (~ 500 MIPs)
 - Tests starting with FEV7 to address embedding issues
 - Noise tests on testboard proceeding (ENC ~ 1 ke-)
- R&D will continue within CALICE
 - SKIROC2 to be submitted with production run
 - **64 channels**
 - **Very large dynamic range**: HG for 0.5 to 500 MIP, LG for 500 to 3000 Mip
 - Simulations are on going
 - Expensive ASIC (**70 mm²** = 70 k€) => MPW not worth it

- Version 1: [June 2009](#), with packaged chips (TQFP 208) for the U structure (3mm available for the electronics)
- Version 2: [September 2009](#), with COB : [see talk by S. Callier](#)
- SPIROC2 used in SKIROC mode



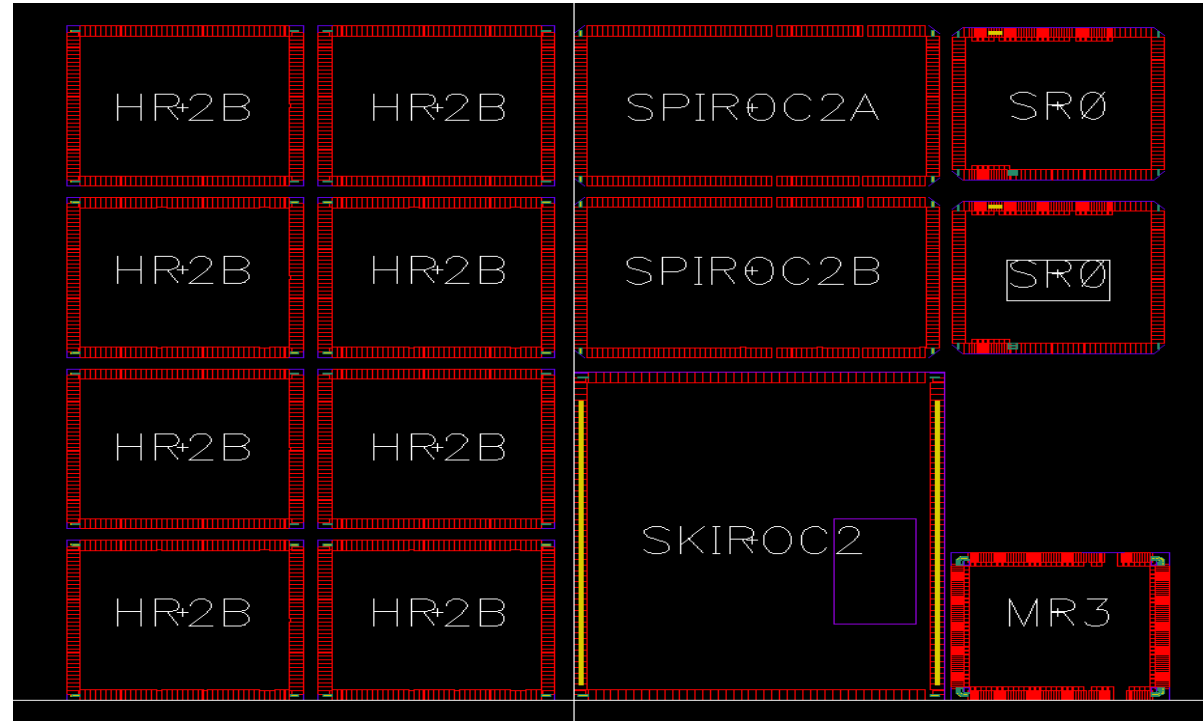
- Measurements on test board
 - Preamp noise
 - S curves
 - Noise : 0.5 fC
 - MIP = 4fC
- See talk by M. Cohen-Solal



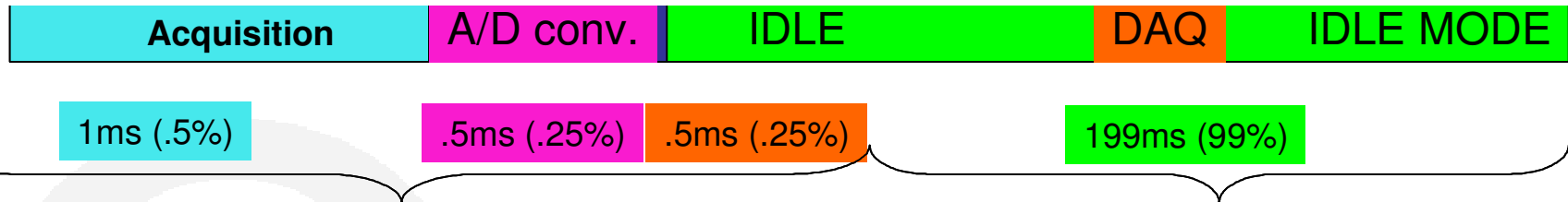
- Reticle : 22 x 18 mm², 50 reticles per wafer
- 25 wafers produced (cost : 150k masks + 100k wafers)
- 1250 chips of each type



- Production run coming up very soon : feb 2010
 - Chips (bare dies) expected may 2010
 - Selective dicing + packaging to proceed



- Data rate (Spiroc/Skiroc) : naive estimate
 - Volume : $36\text{ch} \times 16\text{sca} \times 50\text{bits} = 30 \text{ kbit/chip}$
 - Conversion time : $16 \times 100 \mu\text{s} = 1.6 \text{ ms}$
 - Readout speed 5 MHz (could be increased to 10-20 MHz)
 - 8 chips/DIF line (one FEV only)
 - Total : $1.5\text{ms} + 30000 \times 200\text{ns} \times 8 = 50 \text{ ms}/16 \text{ events} = 3 \text{ ms/evt}$
 $\Rightarrow 300 \text{ Hz during spill}$



- Overall readout rate
 - « Add » 1-10% power pulsing : 3-30 Hz effective rate
 - Pessimistic as assuming all chips full
 - **interesting tests to be done**
- Note : readout electronics designed for ILC low-occupancy, low rate detector **≠ Testbeam !!**

Read out: token ring

- Readout architecture common to all calorimeters
- Minimize data lines & power

