Online Calorimeter Calibration System

LAL-Orsay

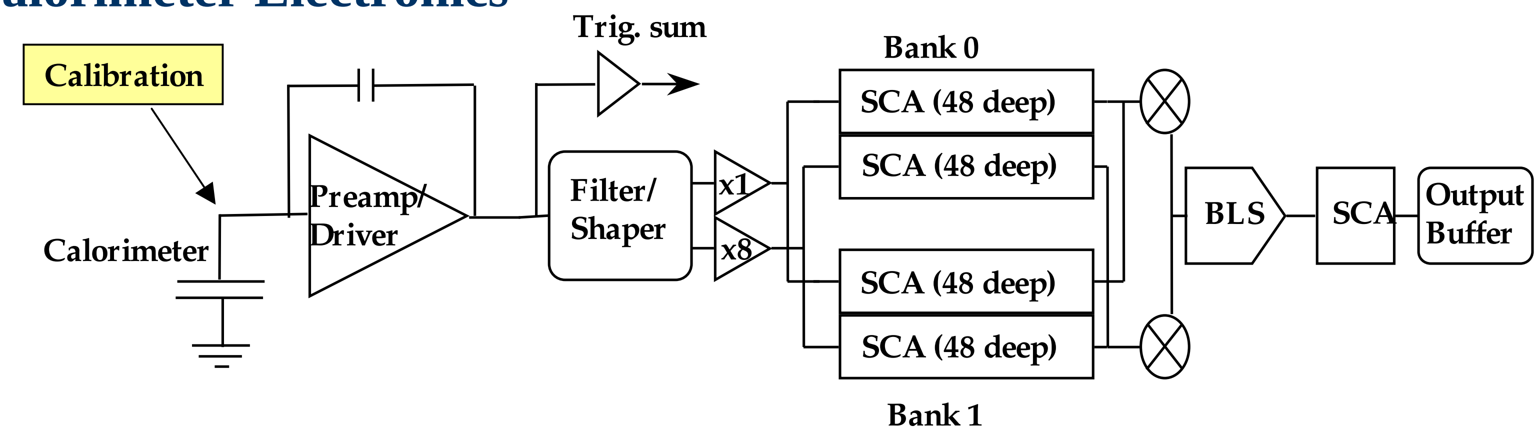
Patrick Cornebise, Pierre Imbert, Yves Jacquier, Gisèle Martin, Pierre Pétroff, Mélissa Riedel, Christophe de la Taille

LPNHE-Paris

Philippe Bailly, Ursula Bassler, Gregorio Bernardi, Jean-François Huppert, Hervé Lebollo, Frédéric Machefert, Bob Olivier, Alain Vallerau

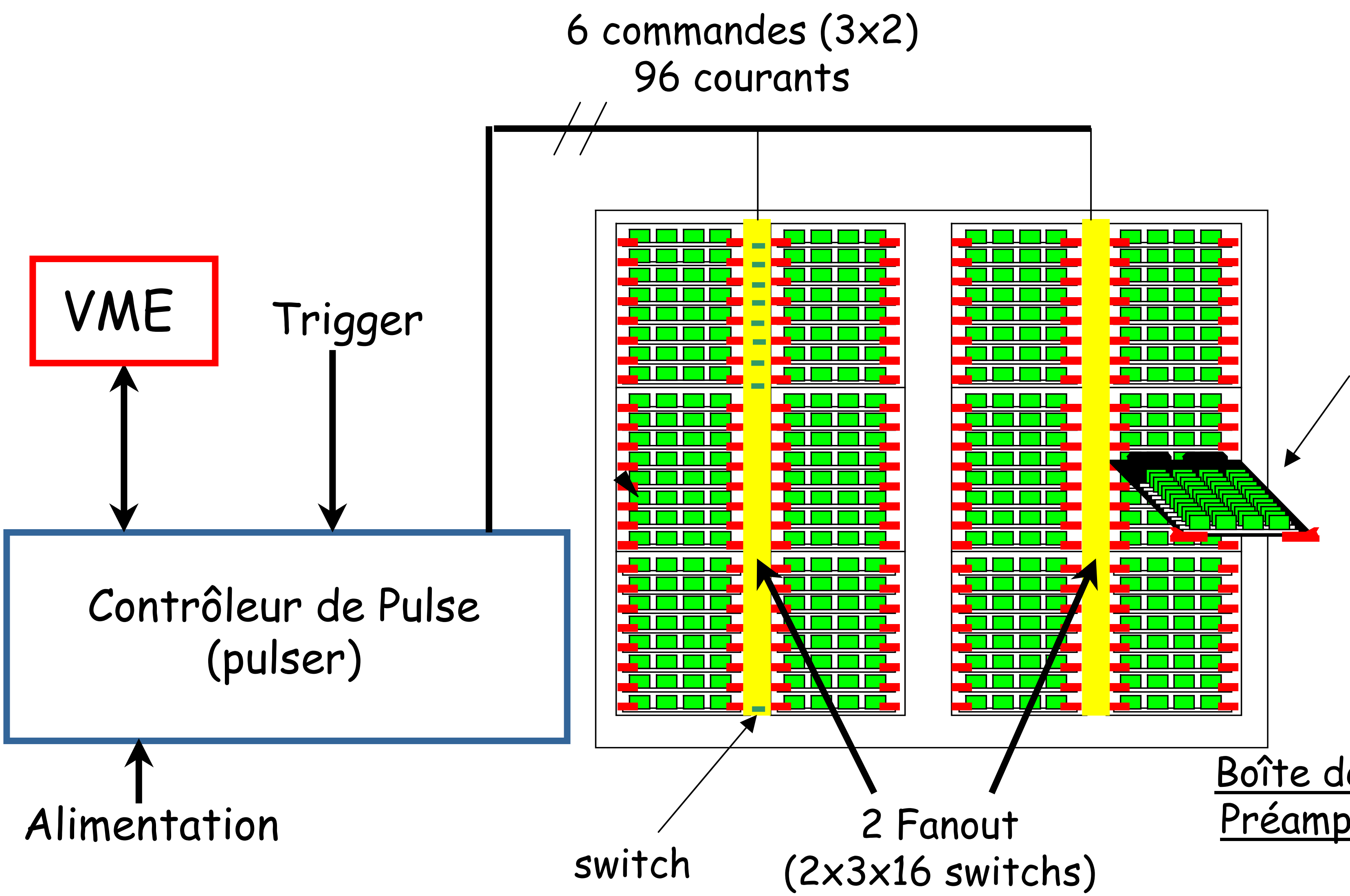
Electronics Calibration

Calorimeter Electronics

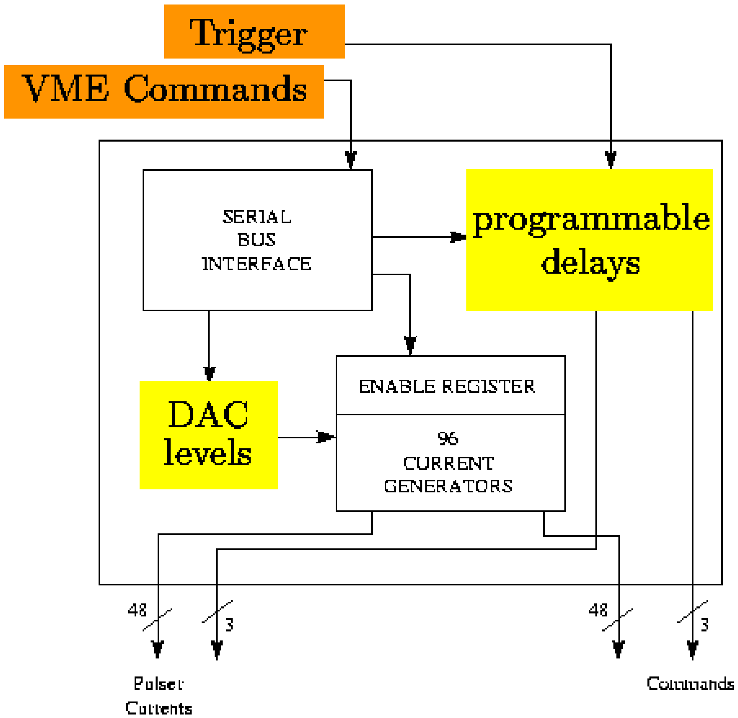


- intercalibration of **cells** and **gain1, gain8**
- estimate of absolute energy scale
- calorimeter electronics commissioning:
  - bad channels
  - trigger verification
  - mapping

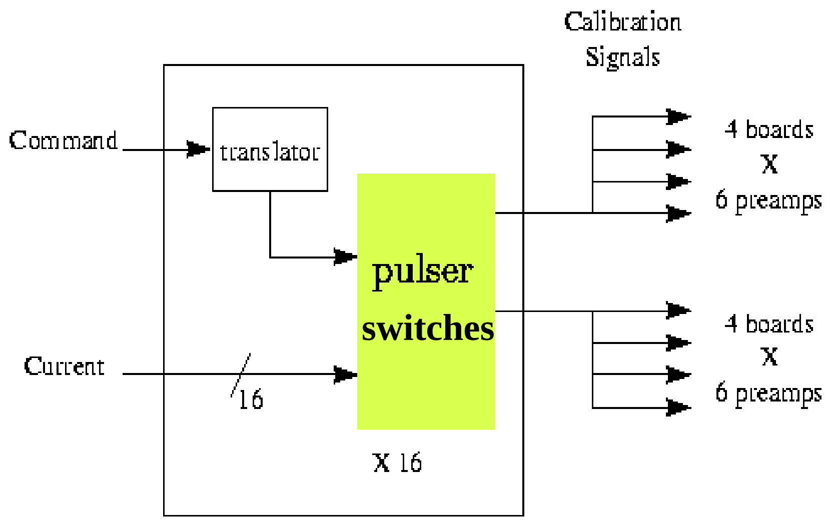
Calibration System

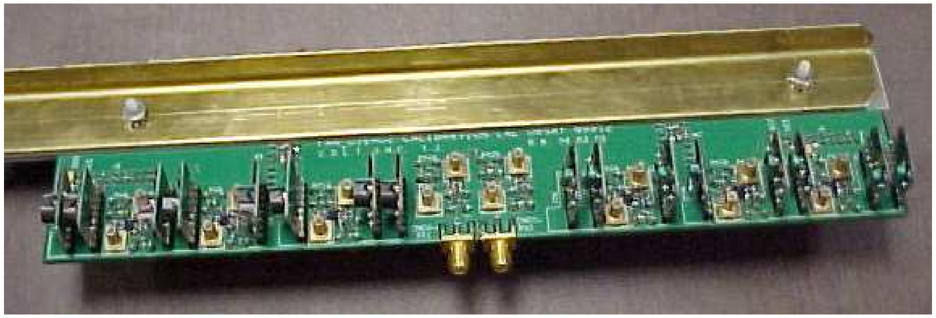


Calibration System: Pulser

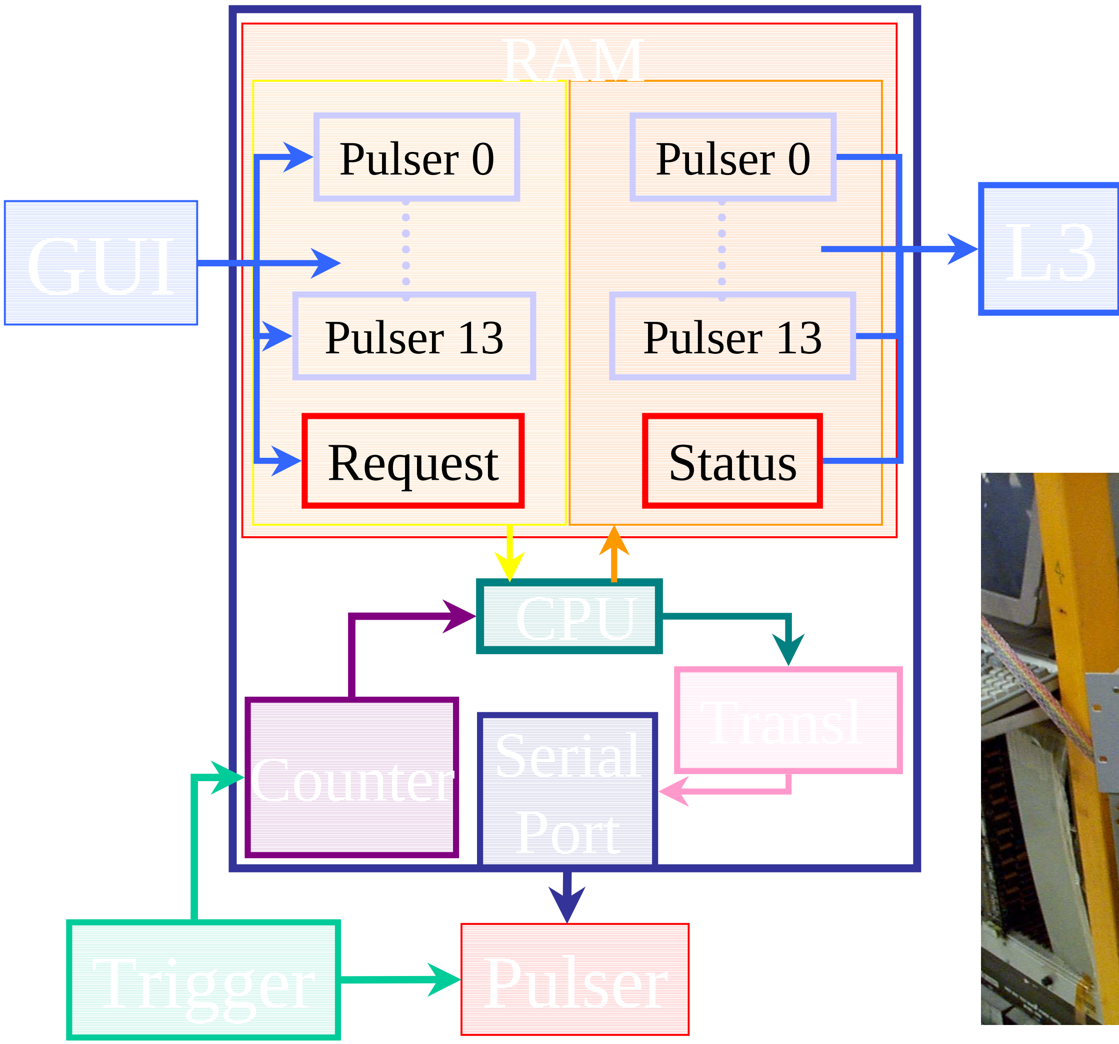


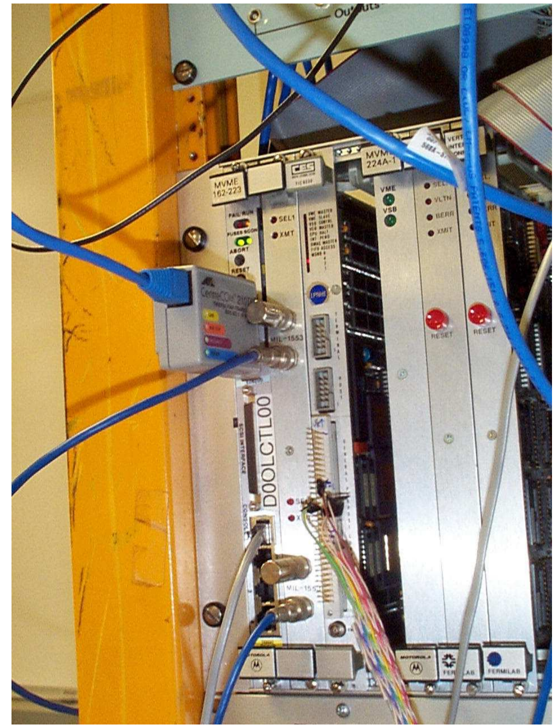
Calibration System: Active Fan-Out

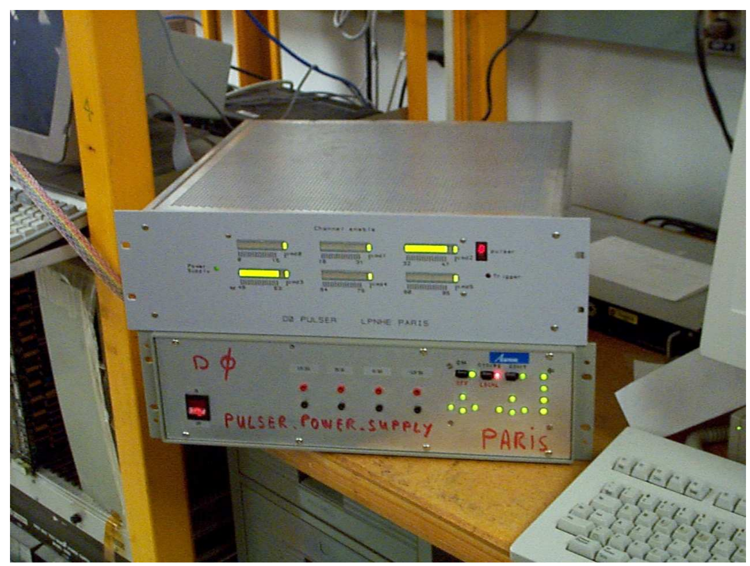


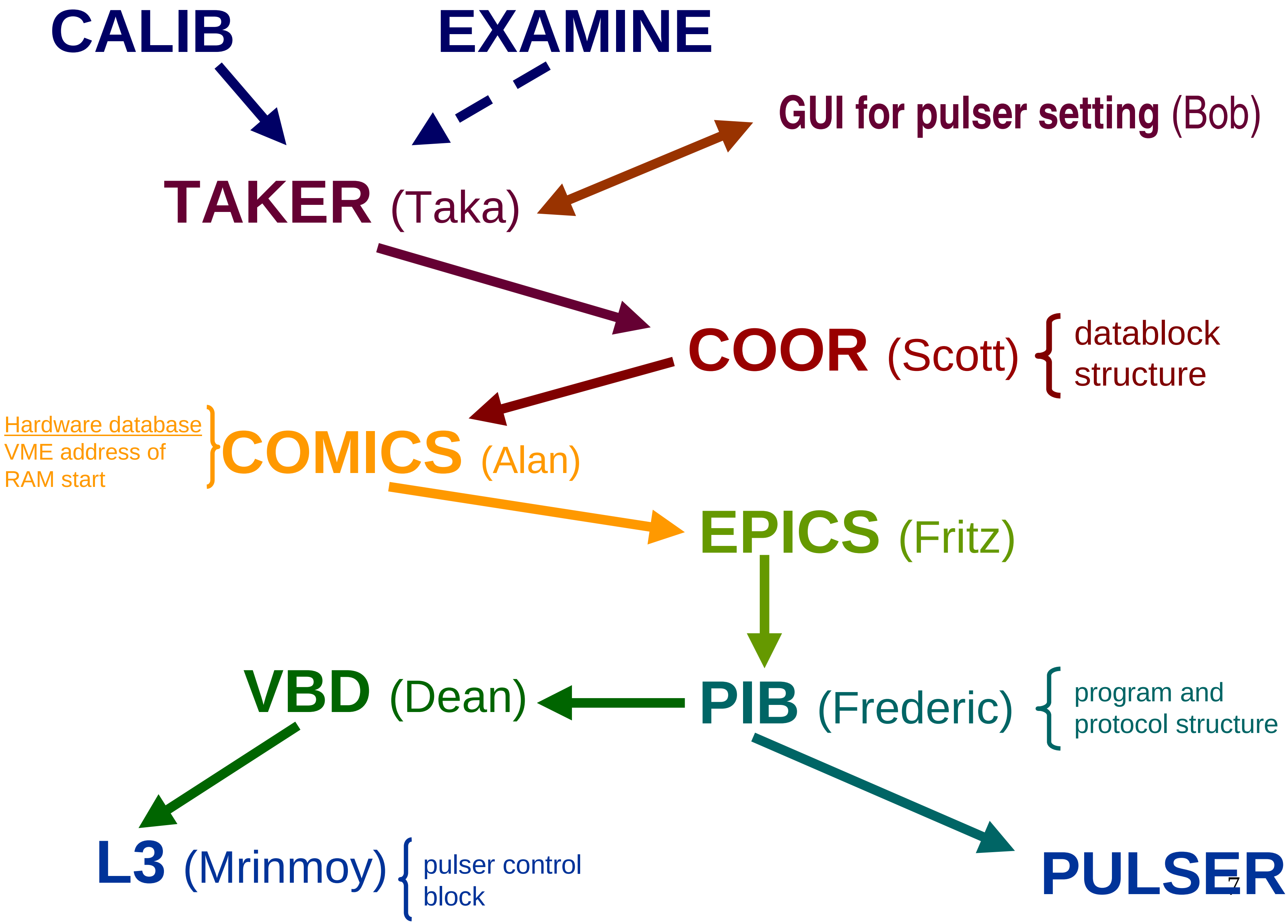


Calibration System: Pulser Interface Board





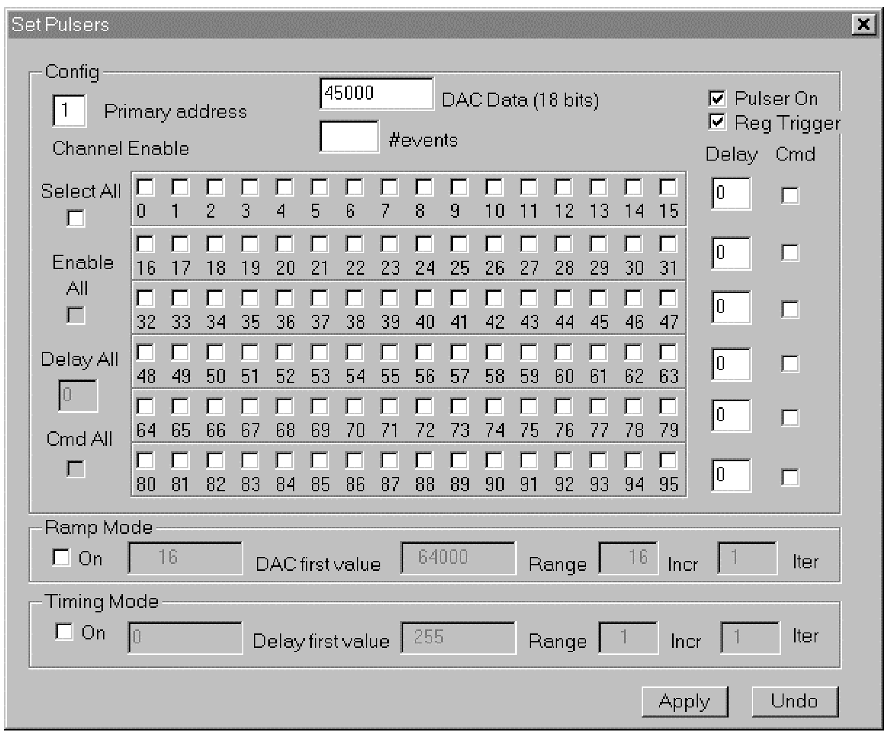



CALIB
EXAMINE
GUI for pulser setting (Bob)
TAKER (Taka)
COOR (Scott)
datablock
structure
Hardware database
VME address of
RAM start
COMICS (Alan)
EPICS (Fritz)
VBD (Dean)
PIB (Frederic)
program and
protocol structure
L3 (Mrinmoy)
pulser control
block
PULSER

Software: GUI for Pulser Control

Pulsers Configuration to download:

- signal height (DAC)
- Enable for each pulser channel (patterns)
- Commands
- Delay

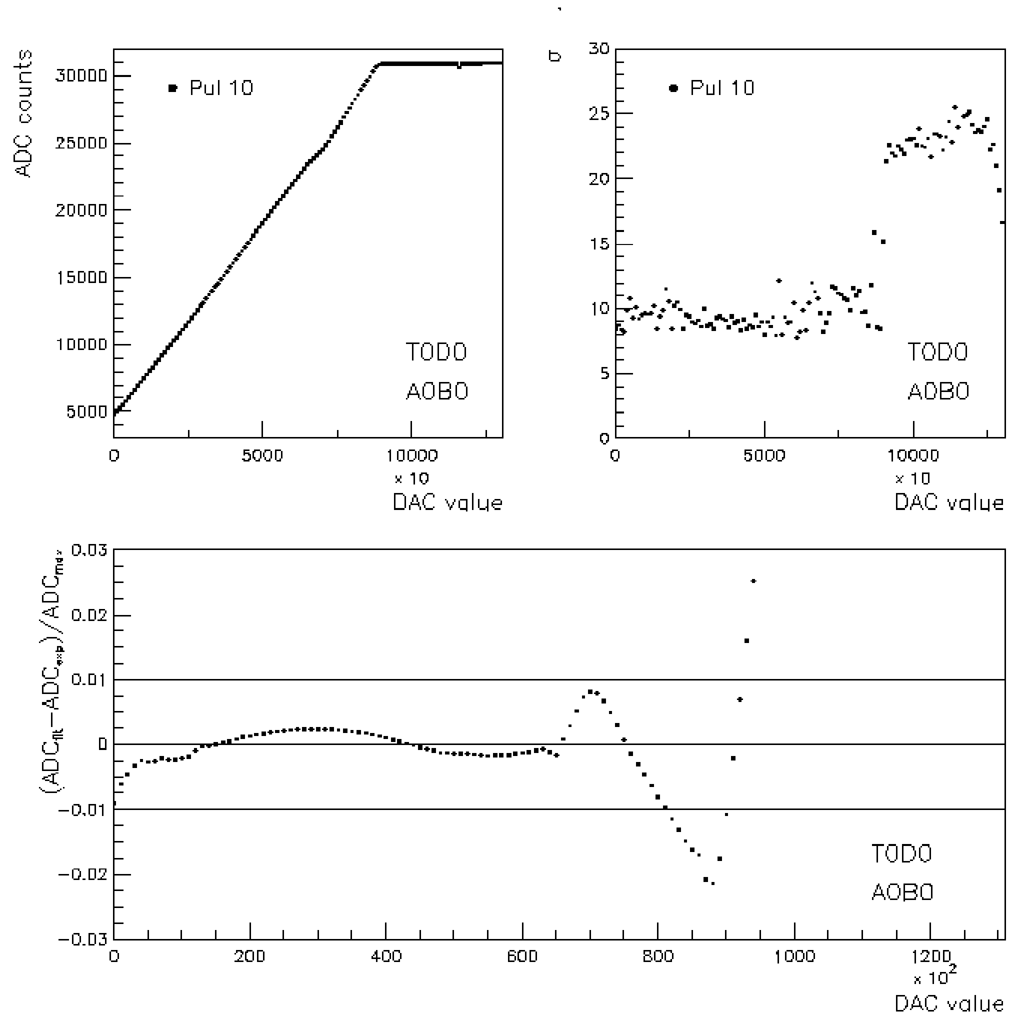


Calibration loop parameters:

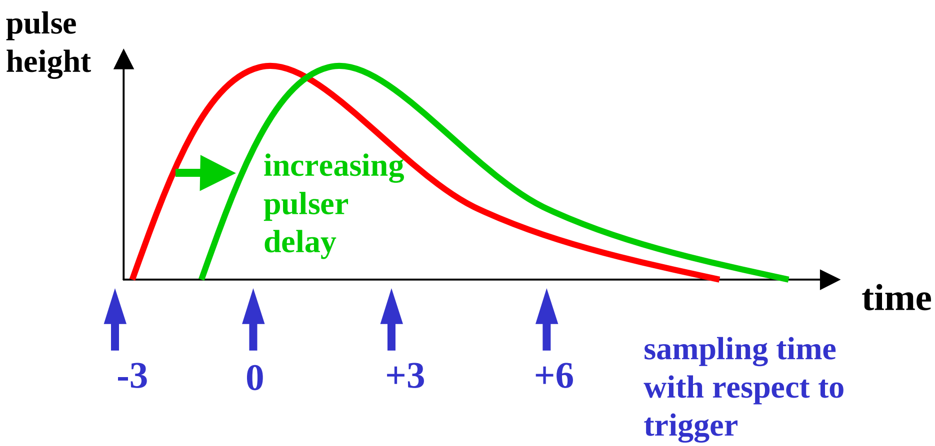
- linearity/timing
- number of events per step
- step size
- pulser patterns

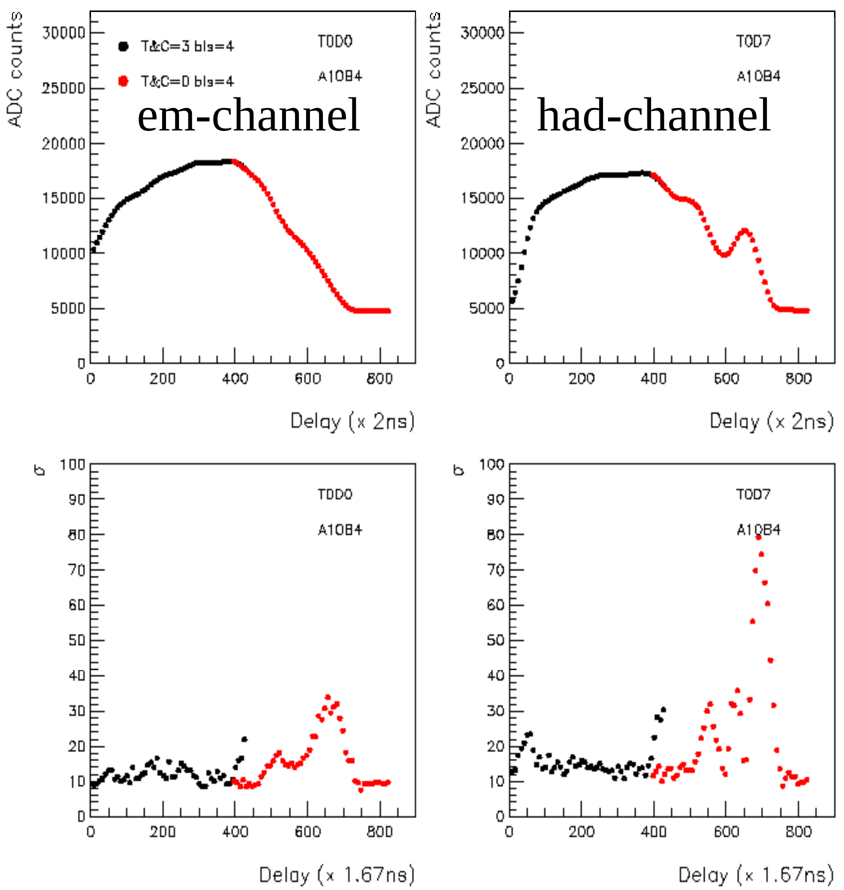
Performances: Linearity

- ADC vs DAC (pulse height)
- full ADC range covered at DAC=90k
- linearity of calibration + calorimeter electronics better than 0.2% up DAC=65k
- no significant noise added from the calibration system



Performances: Pulse Shape





- scanning pulse shape by varying delay
- max response obtained for different delay values in em/had channels:

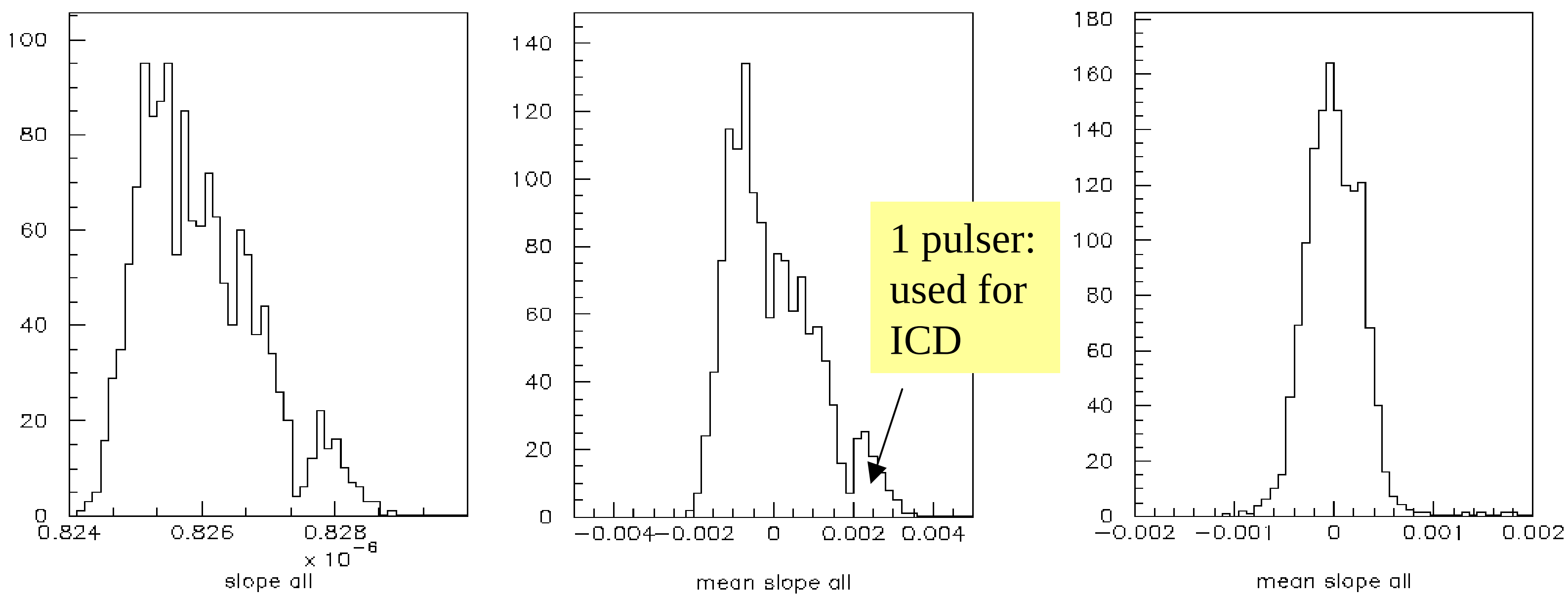
⇒ to be taken into account for pulser pattern determination

⇒ different runs at different delay values necessary

- instability in the beginning of the pulse
- effect of BLS visible

Performances: Pulser Uniformity

- direct measurement of pulser currents over whole DAC range
- fit of the slope for all channels of all pulsers



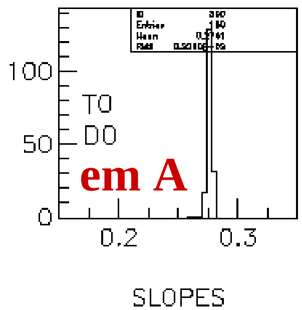
Slope current/DAC

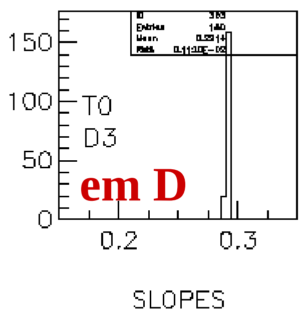
Dispersion of slopes below 0.2%

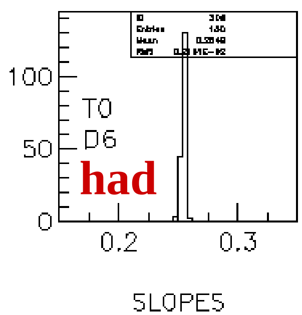
Dispersion of channels in one pulser below 0.1%

Performances: Pulser Uniformity

- ADC vs DAC measurement of all pulsers in 5k-test with the same preamp card



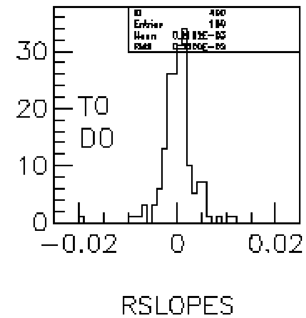


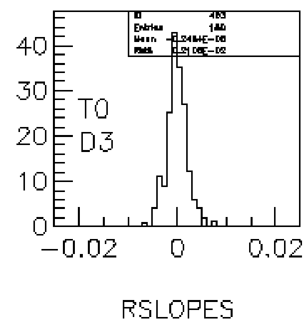


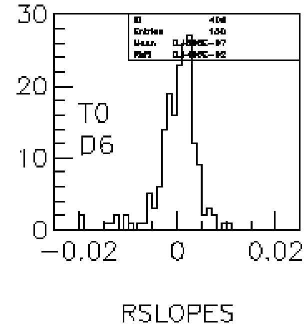
- measurement of slope for different preamps-types:

- variations in slope between different pre-amp types

⇒ correct timing necessary for different types! (pulser patterns!)

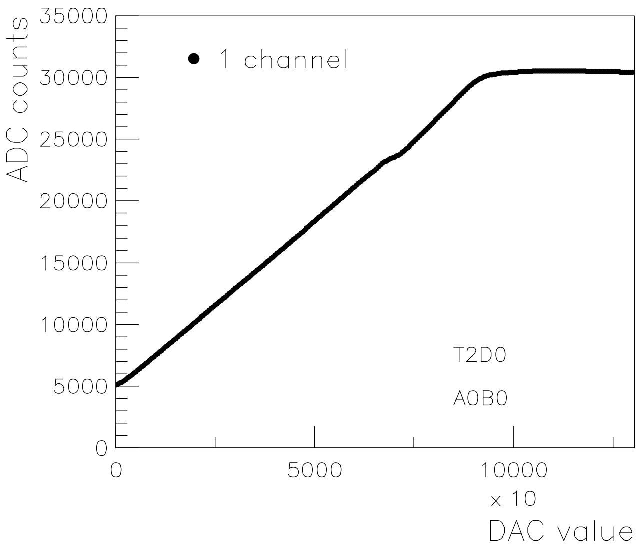


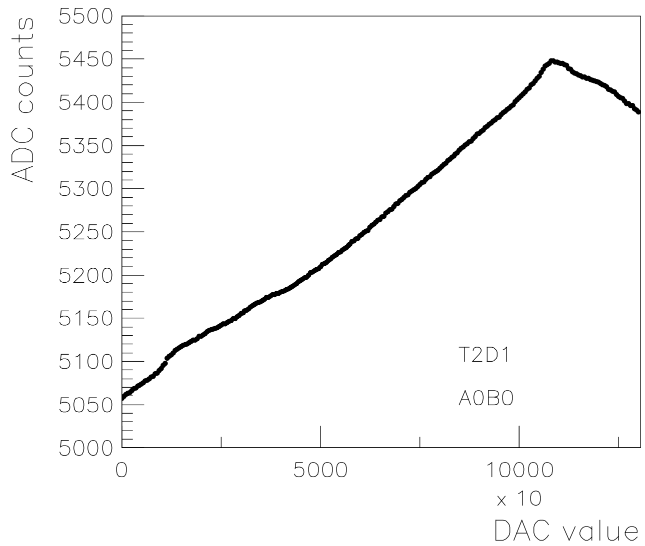




- uniformity by comparing measurements from all pulsers on same channel ⇒ better than 1%

Performances: Cross-talk





- cross-talk seen in neighboring channels:

– ADC counts in pulsed channel varying by 28k

– ADC counts in neighboring channel varying by 400

$\Rightarrow$ cross-talk < 1.5%

Performances: Wave-form analysis

- **in situ "wave-form" measurements**:
  - mapping and cabeling check
  - uniformity determination of complete final system:

  ⇒ correction factors

  - wave-form analysis:

  ⇒ determination of injected charge

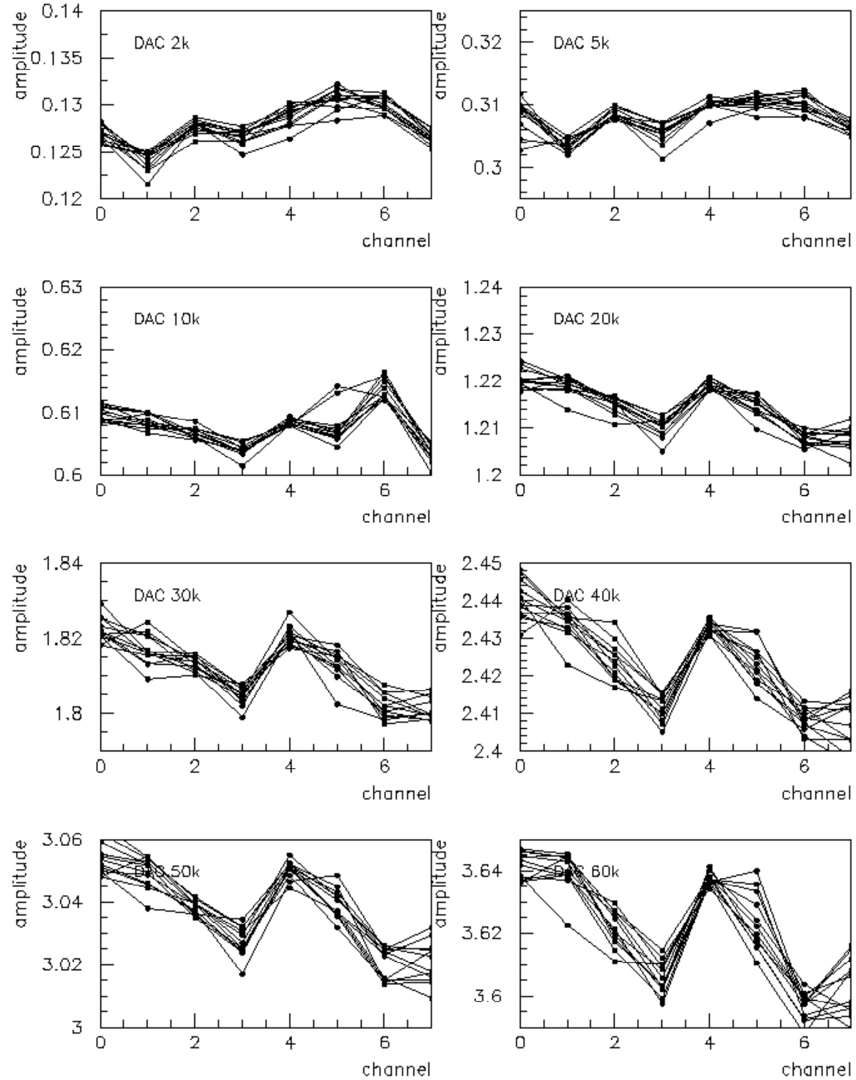
- **method:**

– test card replace preamp motherboard

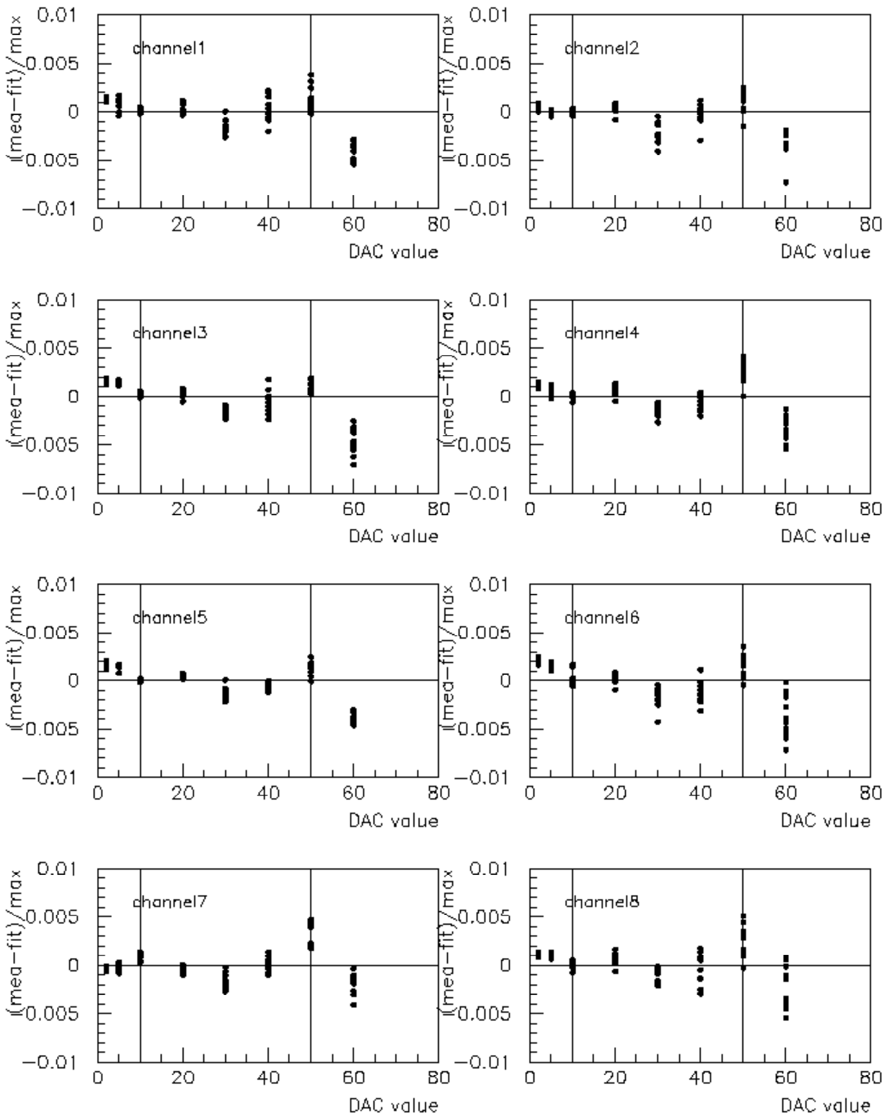
– pulse read out on scope and analysed via GPIB interface

– 8 folded pattern observed:

⇒ correction factors for effects of test-card, scope-gain and backplane



Performances: In-situ Linearity



- observed linearity on amplitude better than 0.5% :

– effects of scope gain visible

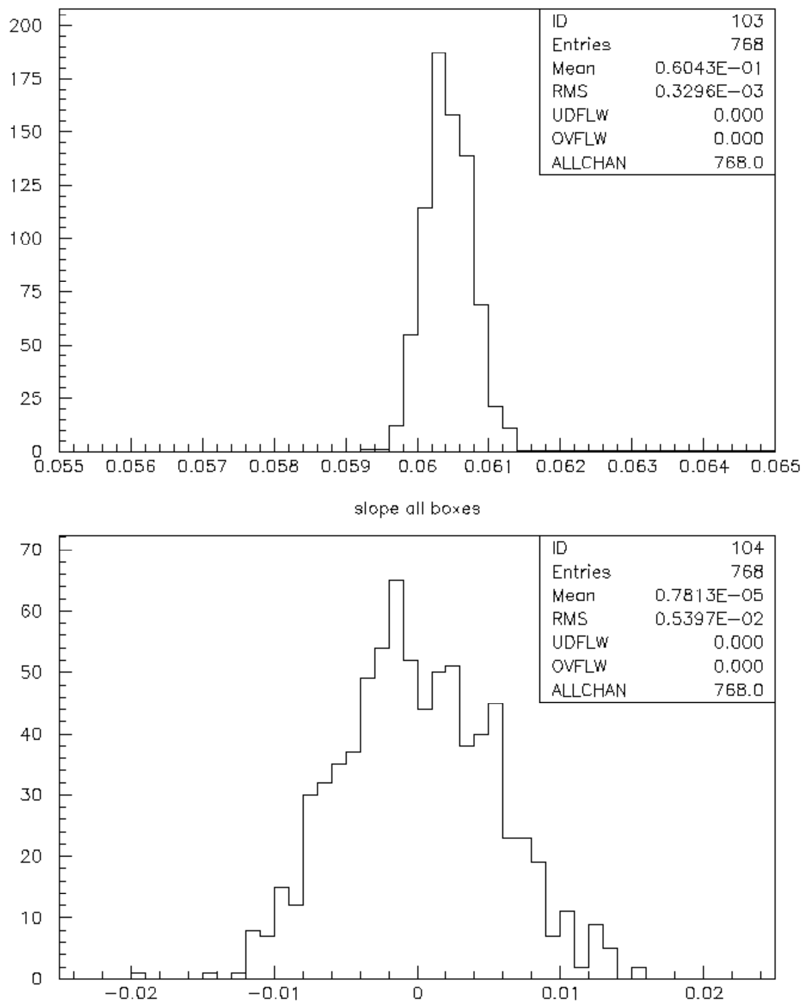
– saturation at DAC > 60k

⇒ no corrections factors applied

⇒ to be studied:

- – integral
- – peak-time
- – decrease time

Performances: In-Situ Uniformity



- slope amplitude vs. DAC determined for all channels of pulsers in CC/ECN
- without corrections uniformity bettter than 1%
- **to be done:**

– measurements after installation completed (Oct 2000)

– with preamp cards installed

– determination of correction factors

–determination of injected charge for charge/DAC correspondance

Schedule

- **Nov 98:** first protopype tests Nov'98
- **Fev-June'99:** finalisation of design for Pulser and FanOut
- **July'99:** cabeling CC/ECN
- **Oct'99:** Fan Out installation CC/ECN
- **Dec'99:** Pulser Installation
- **Jan-May 2000:** tests and commissioning
- **June 2000:** Pulser modification (filtering and grounding)
  Power Supply Installation
  Installation and cabeling of PIB
- **Sept-Oct 2000:** Fan Out installation CC/ECS
  tests and commissioning
- Software developpement