09.12.99
HEC/FCAL TB
Analysis Meeting

Electronics in TB-99

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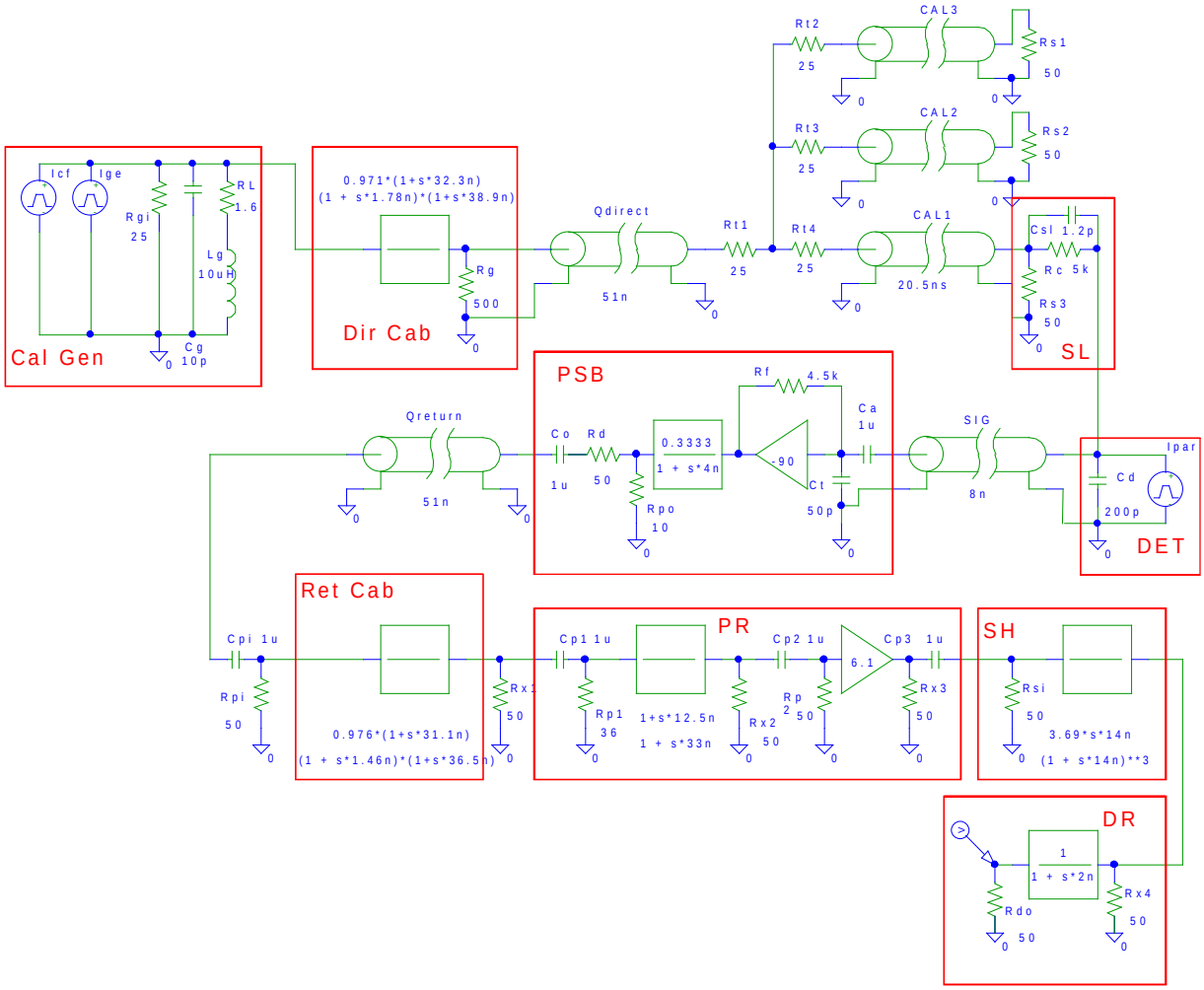
- HEC Electronics chain
- Calibration signal
- Strip-line
- Preshapers
- Shapers
- Bad channels

HEC electronics chain in 1999

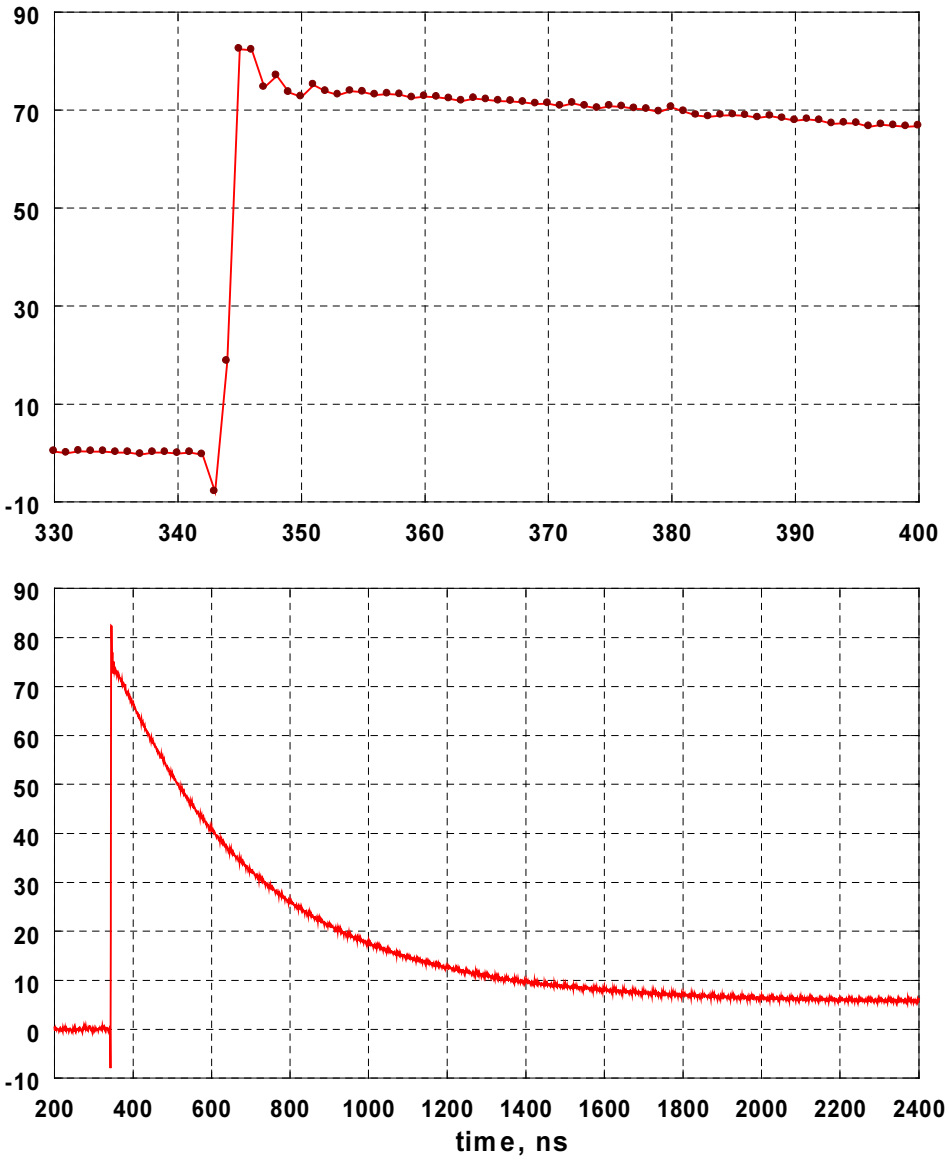
- In PSPICE model all components are described by ideal elements



- Very close to what will be in ATLAS, some modifications are foreseen in calibration generators and in preshaper
- Main components are:
  - calibration generator
  - calibration cables
  - strip-line
  - detector
  - PSB
  - Signal cables
  - FEB (preshaper, shaper, driver)

Calibration generators

- In the beginning it was described by ideal voltage source with pure exponential shape, it was found that this approximation works not very well
- Measurements in lab has been done last days. Example of the signal on the generator output



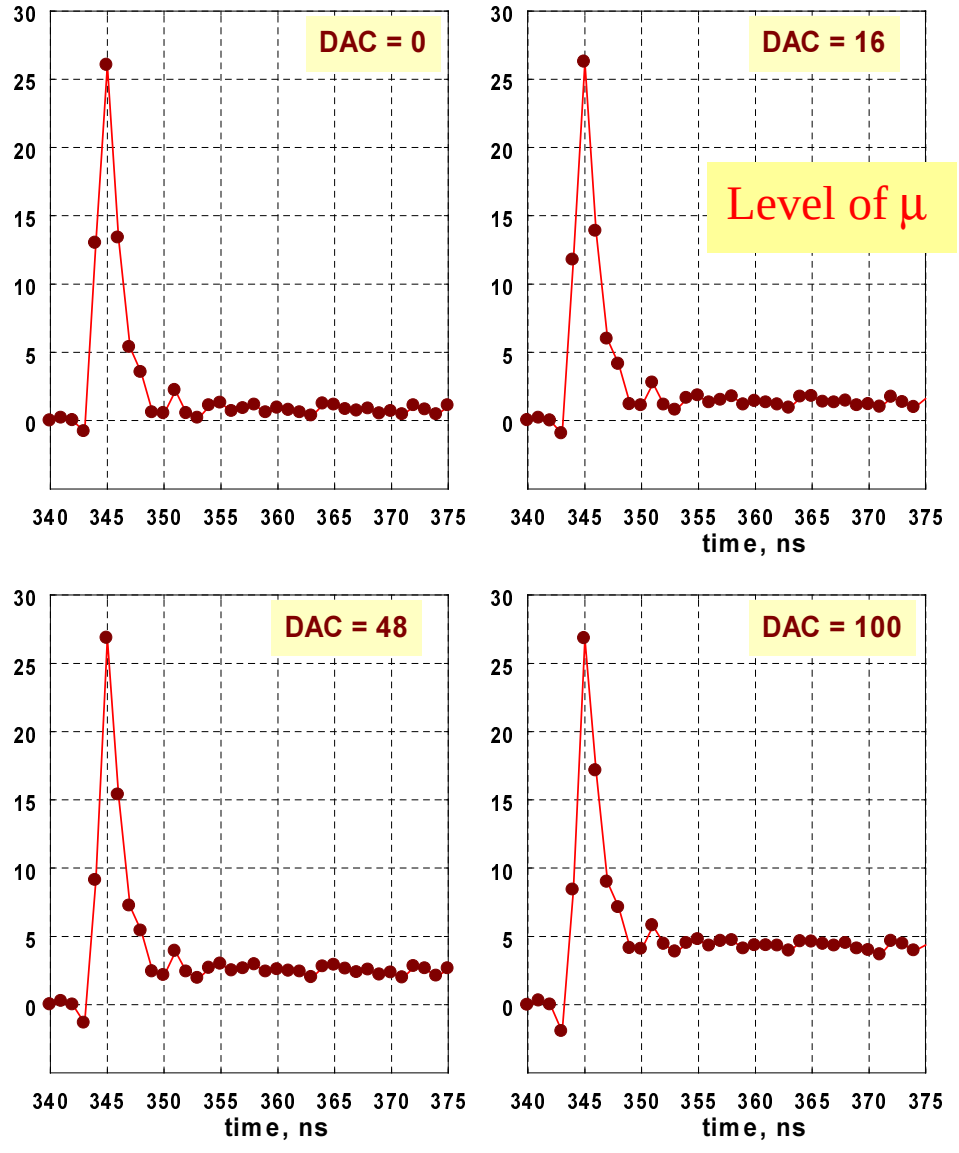
- Imperfections are: short overshoot in the beginning and offset in the pulse end, they studied for all 48 channels used in TB-99

Signal offset

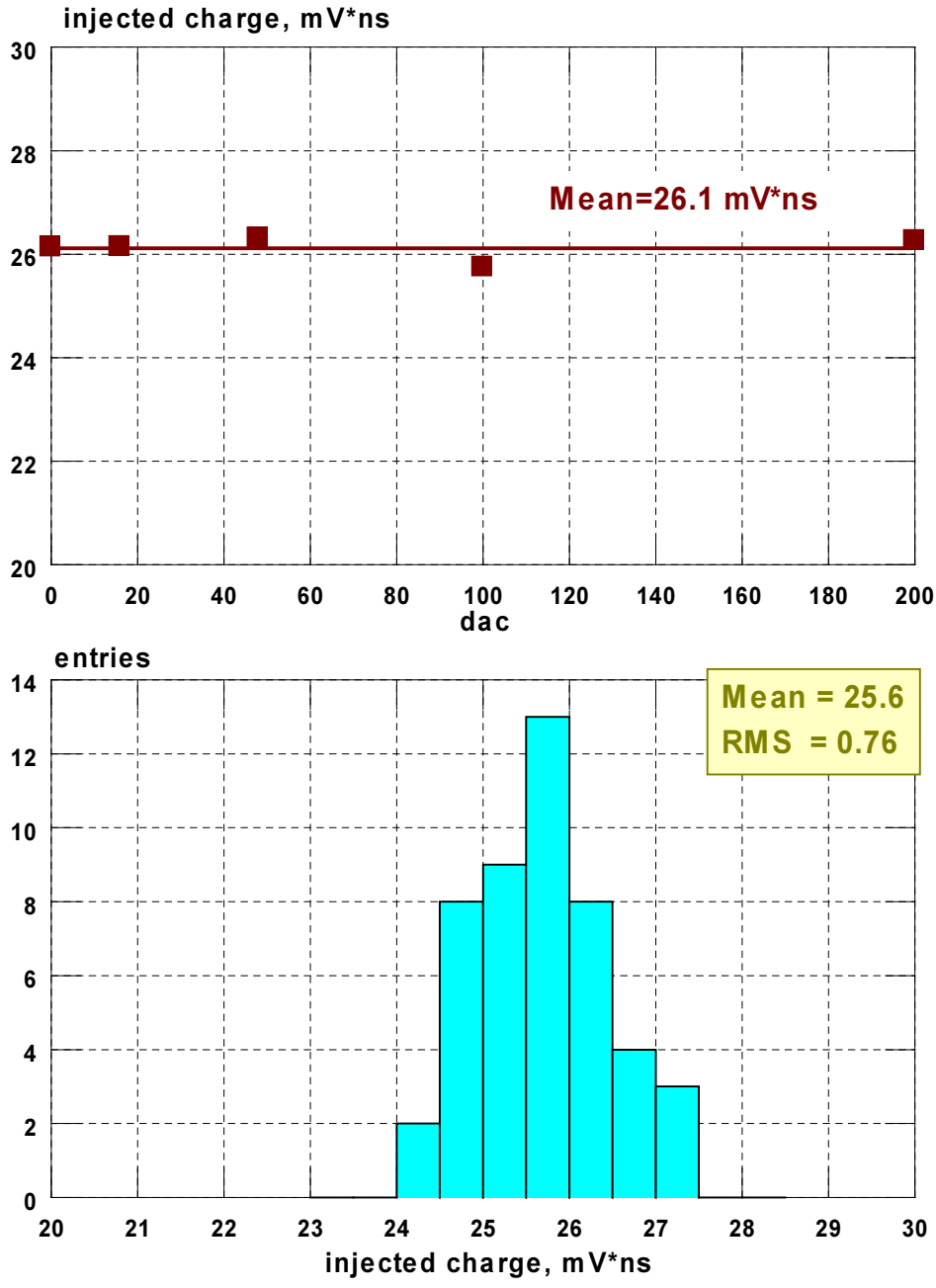
- Comes from resistance of inductance (1.9 Ohm), for 25Ohm loading it gives offset of 7% of the amplitude
- Measurements for 48 channels: (7.16 ±0.09) % , so it can be considers as channel- and amplitude- independent
- Easy to describe in analytical function

Command feedthrough

- It destroys signal for low DAC levels

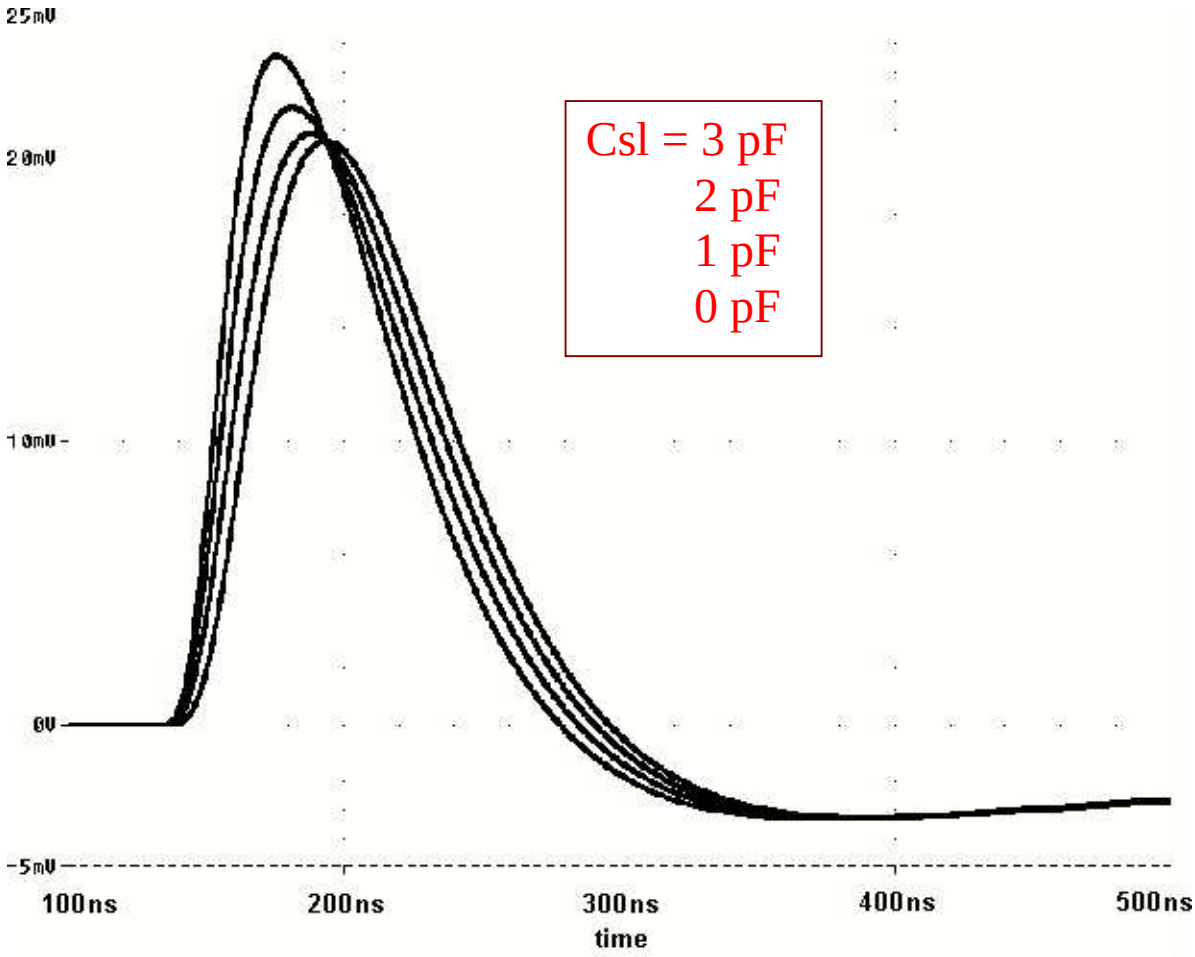


- We found it in agreement with board description (Note ATL-AL-EN-005)
- The calibration in the range of muon signals is imposible
- Big distorsion of shape for low amplitudes
- Difficult to describe in model
- Measurements: CFT is independent on amplitude and equivalent for 48 channels



Strip-line prasitic capacitance

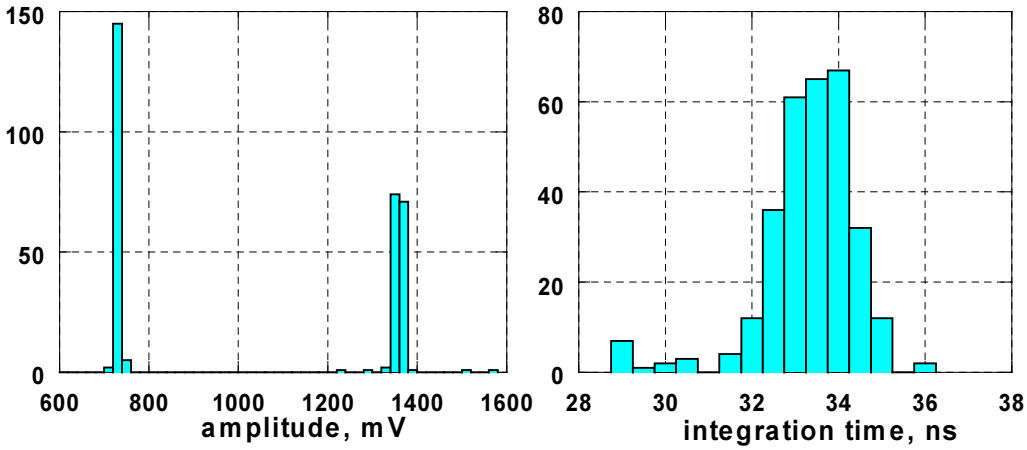
- Calibration current is determined by calibration resistor (Rc=5.0 Kohm). Strip line adds small capacitance parallel to Rc, that changes the signal shape
- PSPICE for DAC=4000:

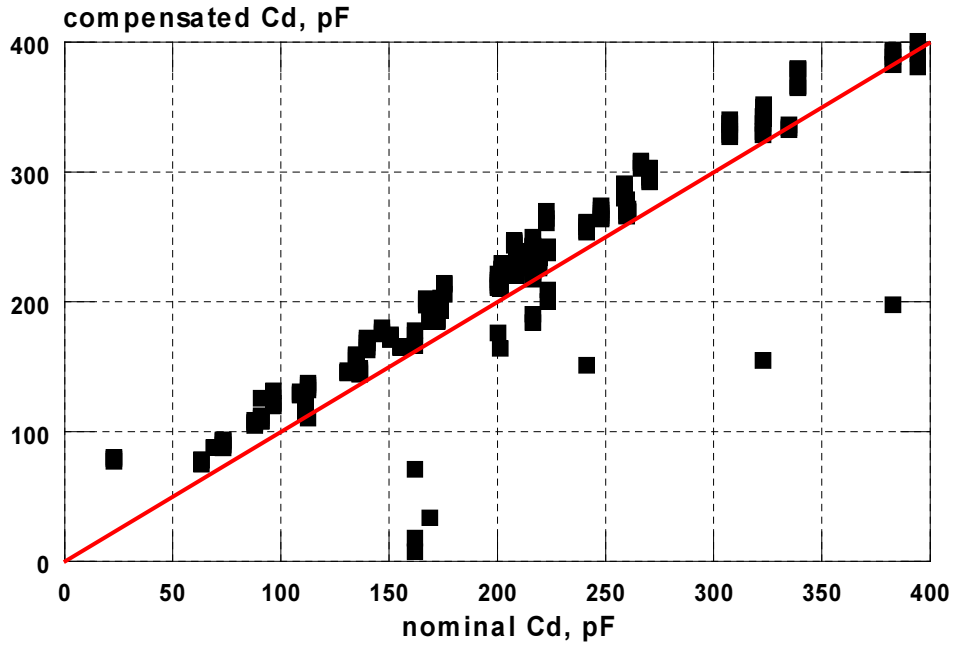


- few % effect even for 1-2 pF
- Measurements in lab. for one of the strip line gives 1.2 pF so the realistic value is 1.5 pF
- This capacitance is introduced to PSPICE model, but not in analytical function

Preshapers

- First use of version.0, they have been prepared just before the run, so all studies made afterwards
- design values:
  - integration time 29 ns (really 29 – 35 ns)
  - rear/front gains 2 (really 1.9)
  - rise time compensation according to Cd (really small overcompensation)
- Part of hybrids corrected, others left like they are

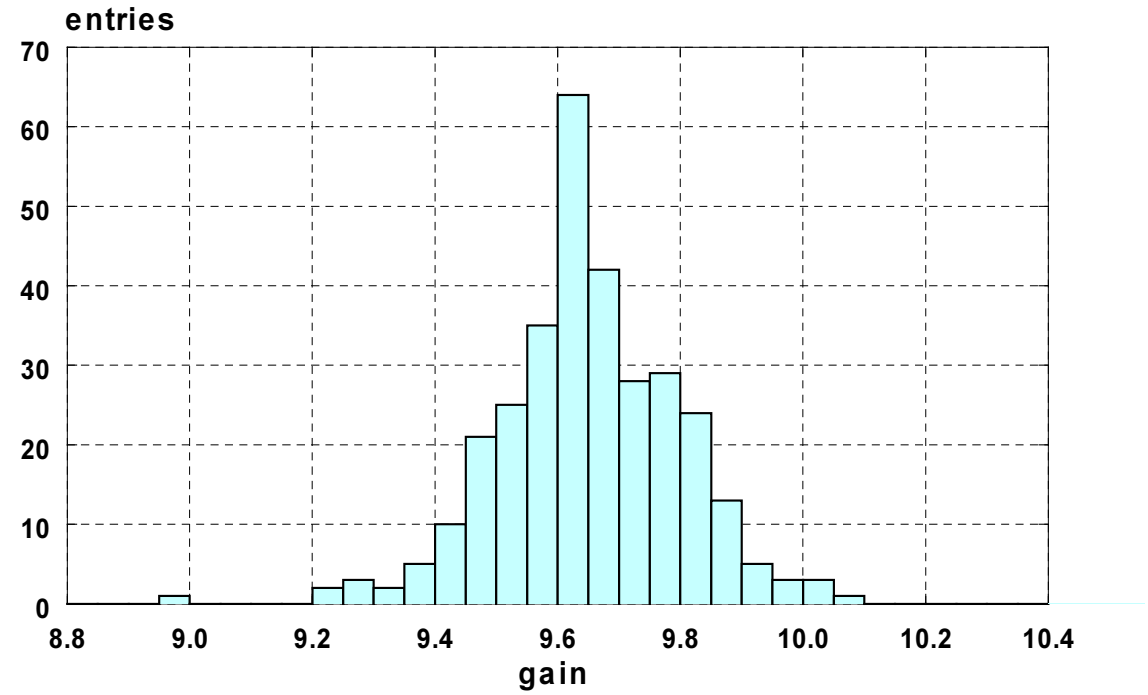


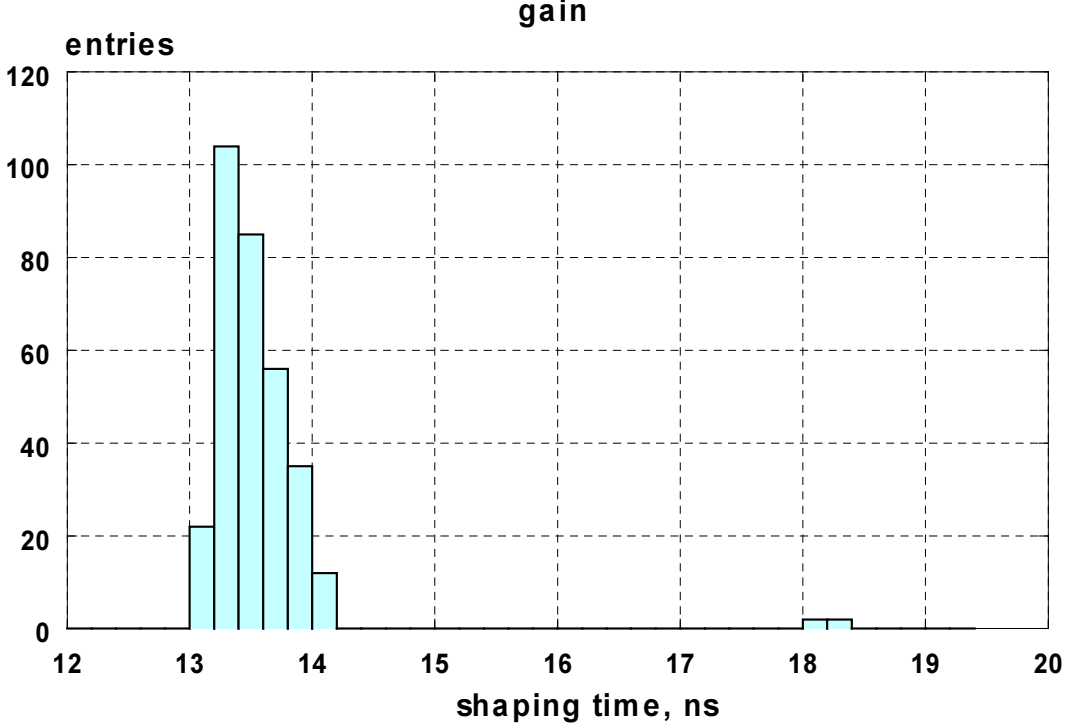


- These hybrids will be used in TB-2000

Shapers

- ATLAS v2.0, time constant 14 ns, medium gain 10
- FEBs have been produced short time before run, they were not studied, all studies have been done after the run





- Bad shapers have been changed

Drivers

- In TB-99 two types of line drivers used – MAX4142 and MAX4147
- Measurements show that they have different transfer functions that gives ~2 ns For TB-2000 we will use one type of drivers

Noise

- Noisy channels were located in the edge (first 4 channels) of each FEB, oscillations appear in FEB only when cables connected
- This noise does not appear in Lab. since we do not have the full HEC cabling and grounding
- So, noise is still not improved, it has to be done next year

Bad electronics channels

- During the Lab. studies bad channels of FEBs have been fixed:
  - ADC 41 – 44 --- shaper time constant
  - ADC 61 --- output connector damaged
  - ADC 102 --- bad capacitor on preshaper
  - ADC 278 --- bad capacitor on preshaper
  - ADC 297 --- line on the FEB is destroyed
  - Another bad shaper chip, but it is not used