Beam Conditioning Monitor
ATLAS, LHC

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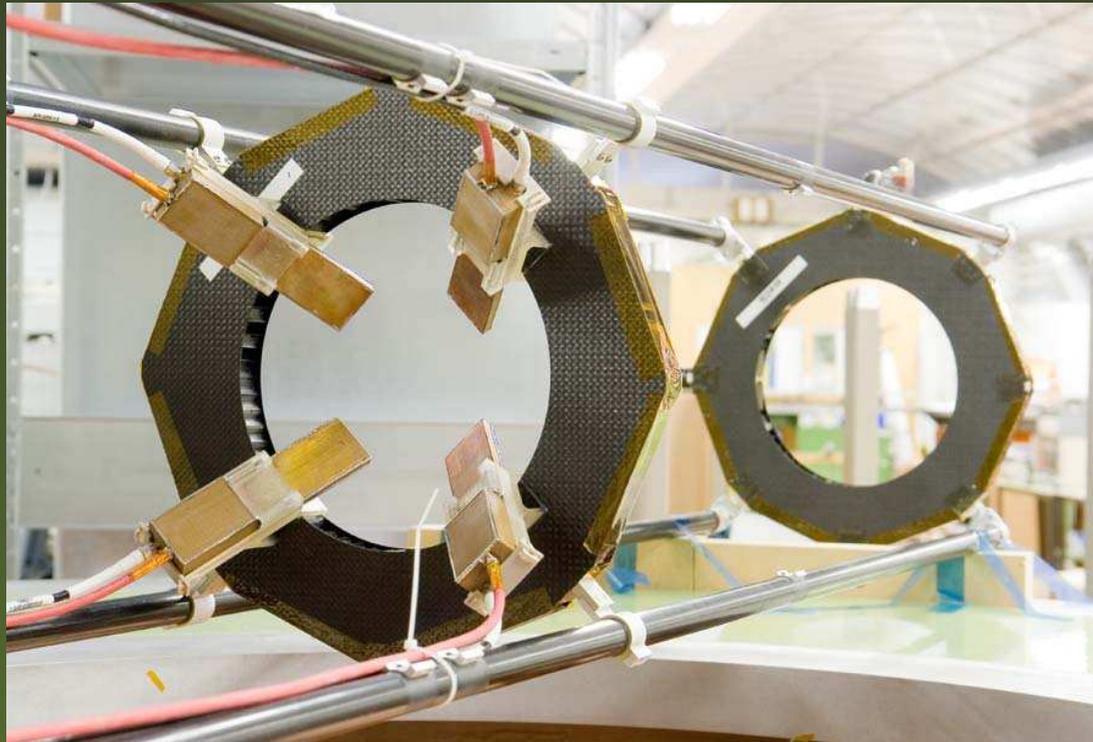
EPF, UiO

This talk

- Introduction to the BCM

- Different setups

- Analysis

BCM

- 8 modules $\rightarrow$ 8 channels

- $\pm 183 cm$ from z=0

- 55mm away from beam pipe

Purpose

- Looking for signs of beam anomalies
  - Beam scraping the TAS collimator, beam-gas interactions
  - Causes background, in worst case damaging the detector
- Information about the beam
  - Luminosity
  - Interaction point(?)

Based on single beam bunch crossings, not integrating the accumulated particle flux.

Principle

- Distinguish between background(TAS, beam-gas) and p-p interactions by time difference

- p-p interactions: each 25ns

- Background events: $\Delta t = 2\Delta z/c$

- $\Delta t = 12.5ns$ when $\Delta z \approx 1.90m$

Principle

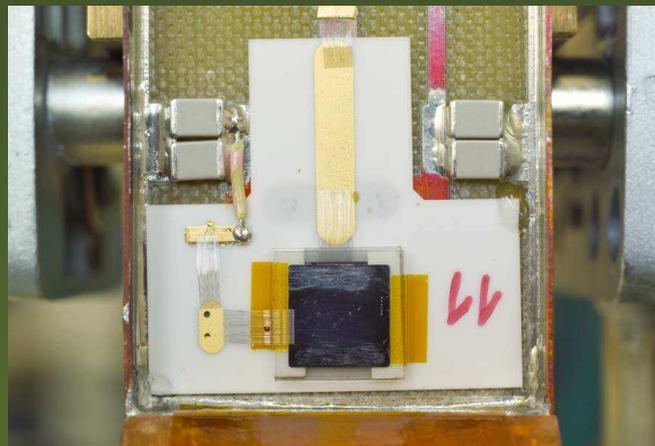- Distinguish between background(TAS, beam-gas) and p-p interactions by time difference
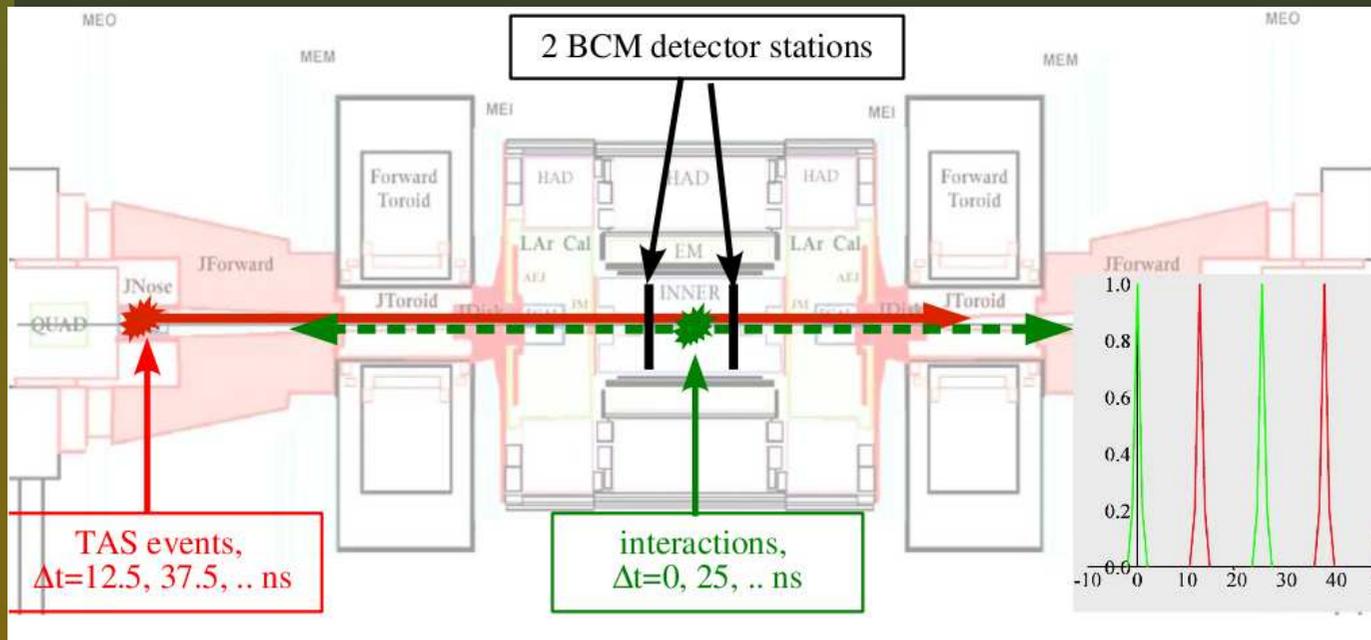
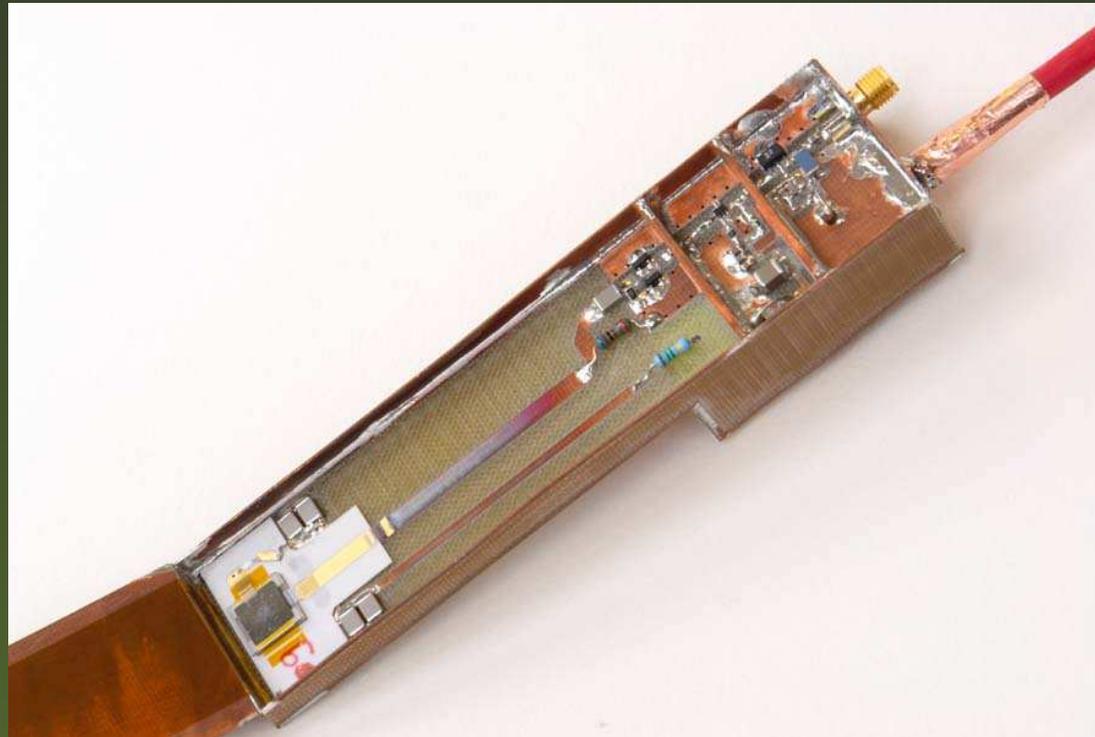- Beam-gas $z < \Delta z$, interaction point

pCVD diamond

polycrystalline Chemical Vapor Deposition(pCVD) diamond

- Radiation hard

- Fast and short signal, important for high speed enviroment

- Very low leakage current

- $1cm \times 1cm \times 500\mu m$

- 2 diamonds back to back at $45°$ to improve SNR

Front-end

- Operated at $\pm$ 1000V $\rightarrow$ High and narrow current pulse
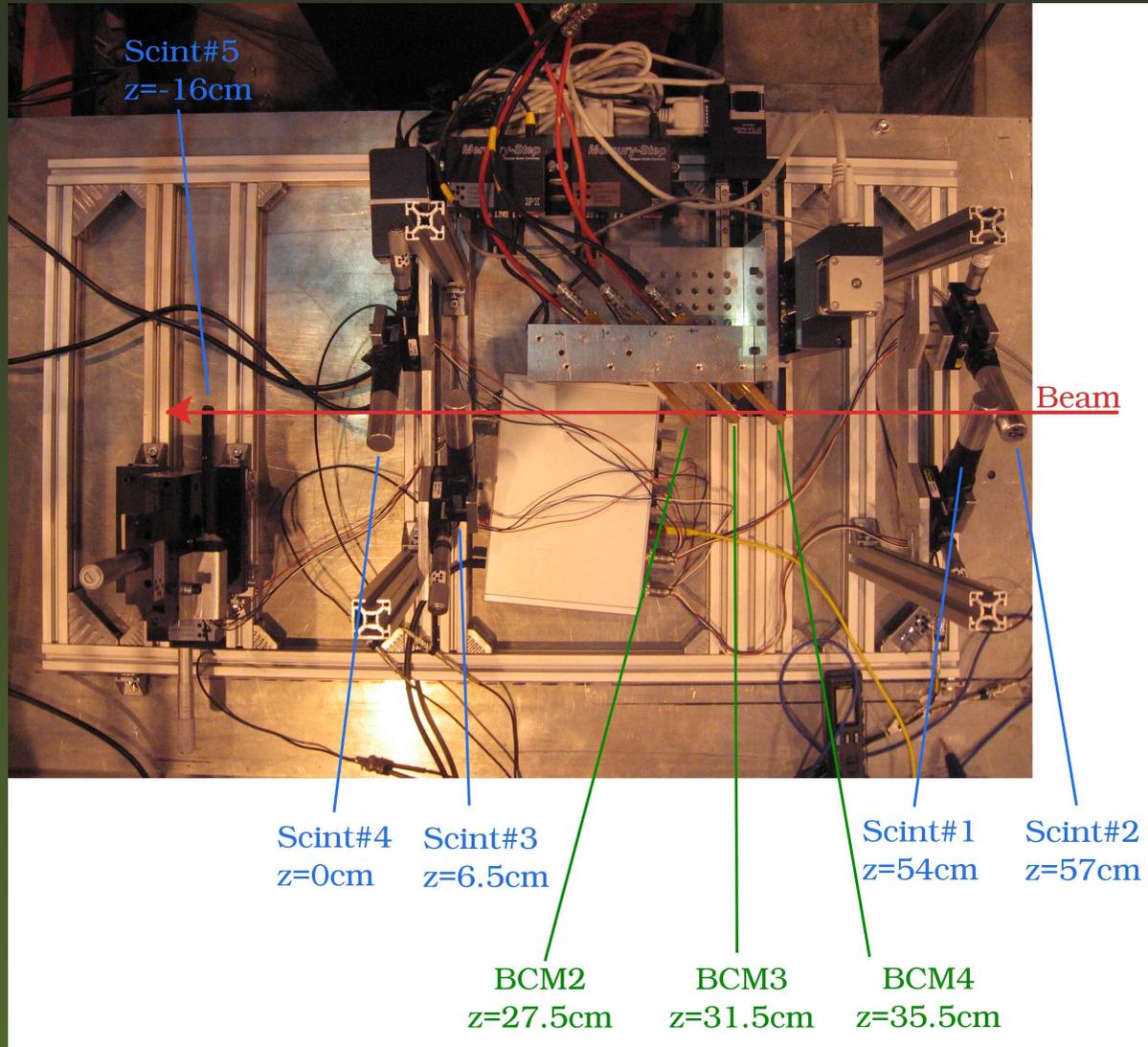
- Two stage Fotec amplifier

Back-end

- NINO
  - amplifier-discriminator
  - Adjustable threshold
  - ~15m coax-cable

- FPGA
  - Field-programmable gate array
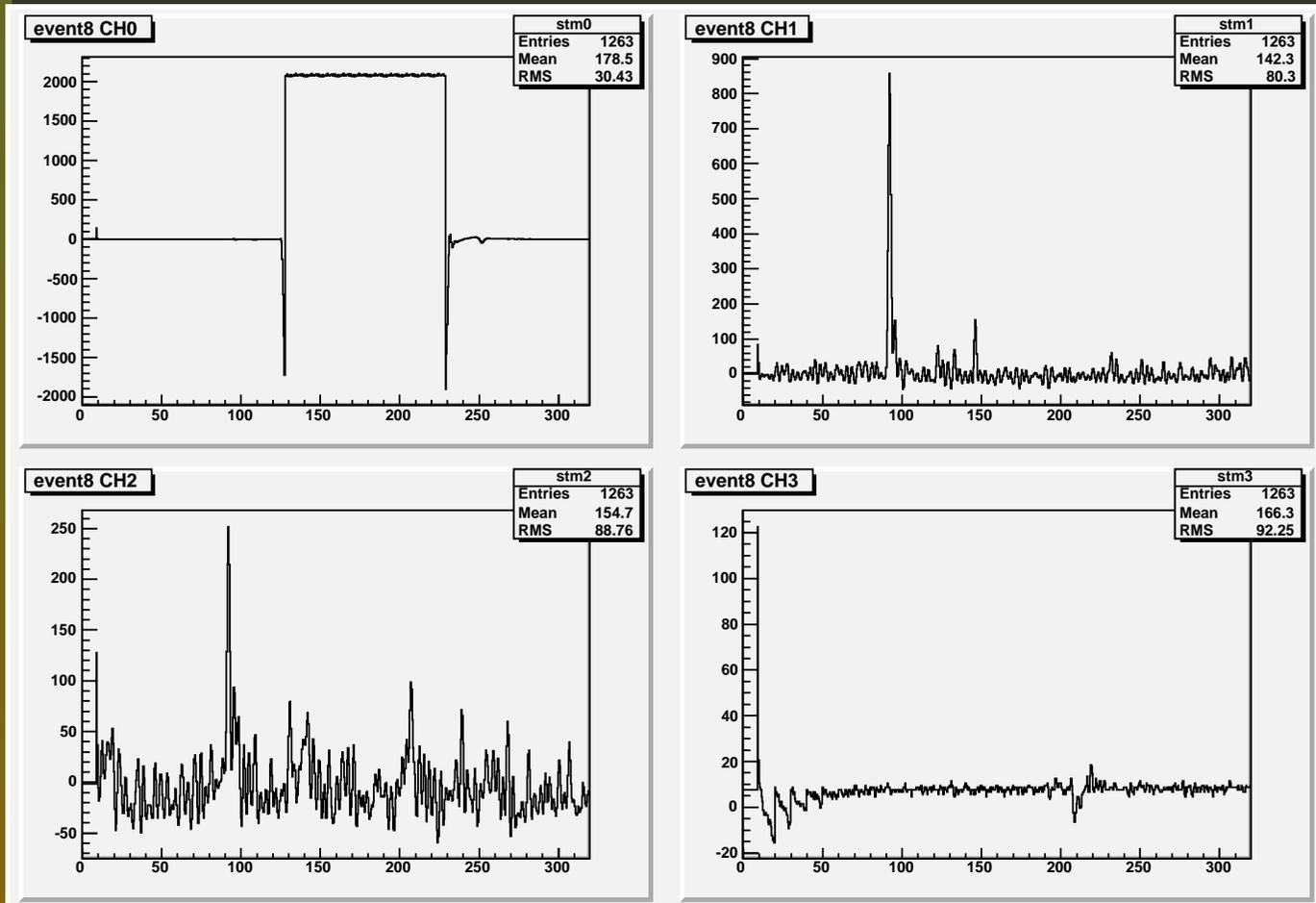 - Programmable logic components
  - ~100m optical fiber

Test beam setup

Position scan, analog, H6

- Ch0:Trigger $\rightarrow$ ADC(CAEN V1729)

- Ch1: Fotec $\rightarrow$ Ampl.(ORTEC FTA820) $\rightarrow$ Discr.(ORTEC QUAD CFD) $\rightarrow$ ADC

- Ch2: Fotec $\rightarrow$ Ampl.(ORTEC FTA820) $\rightarrow$ Discr.(ORTEC QUAD CFD) $\rightarrow$ ADC
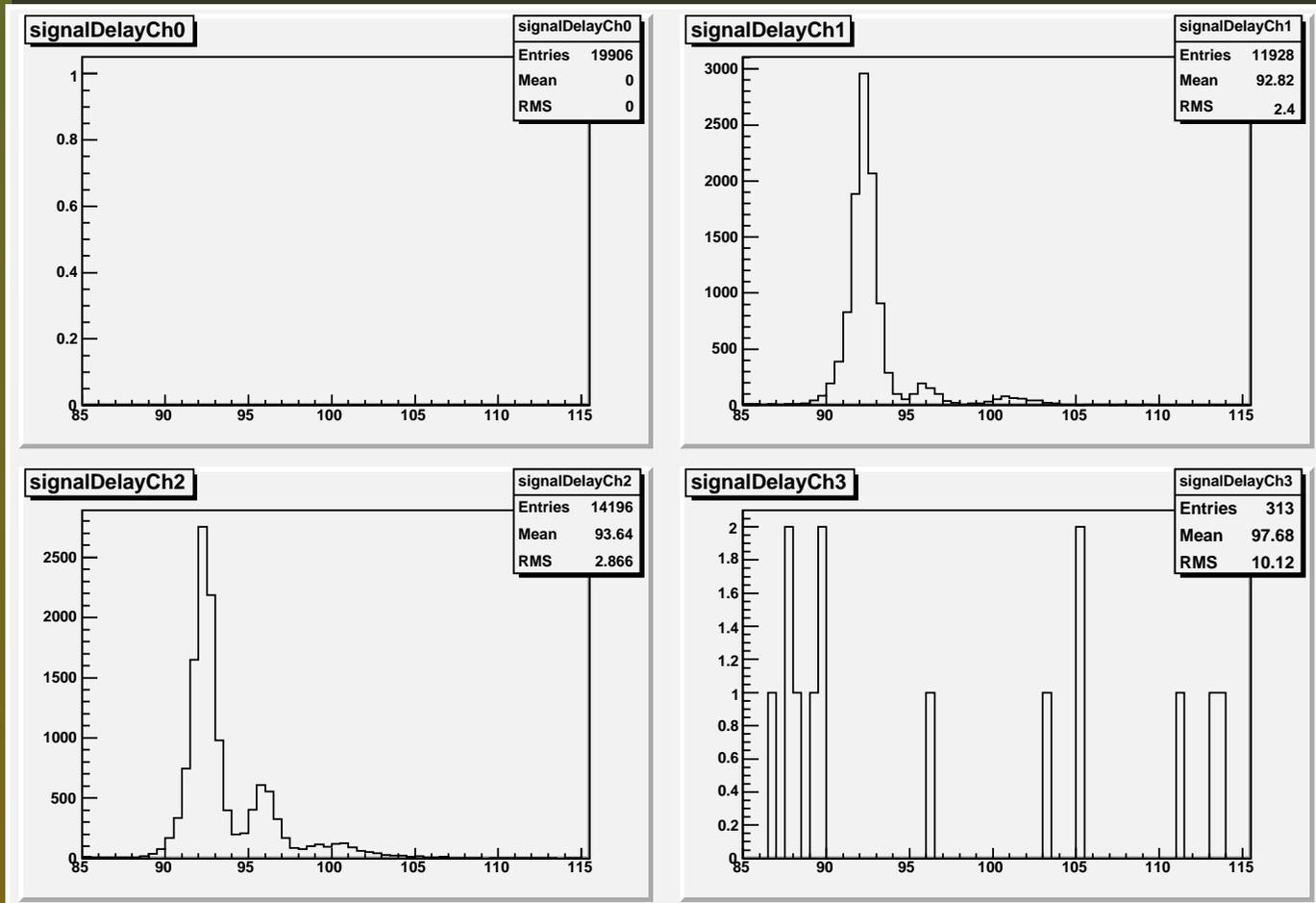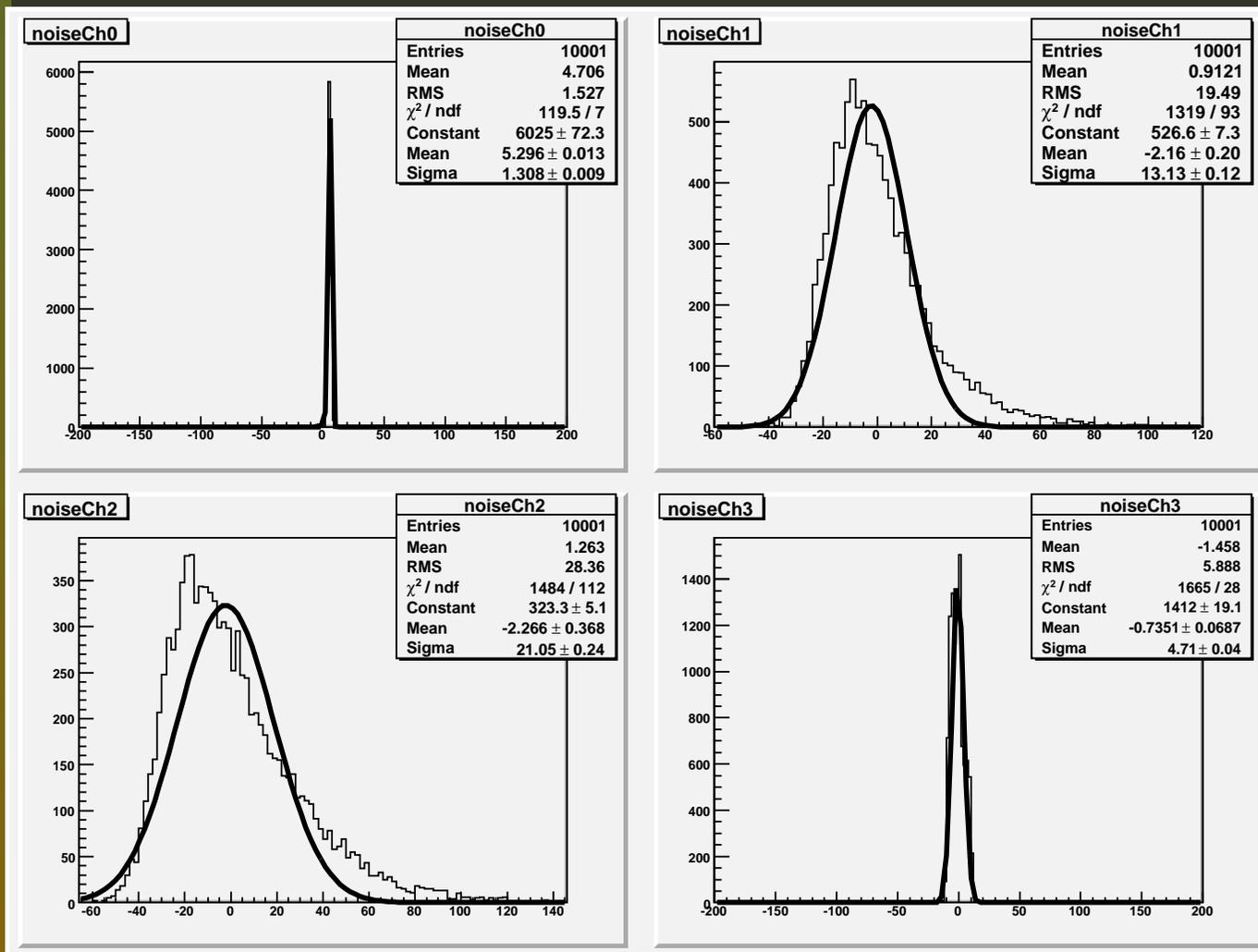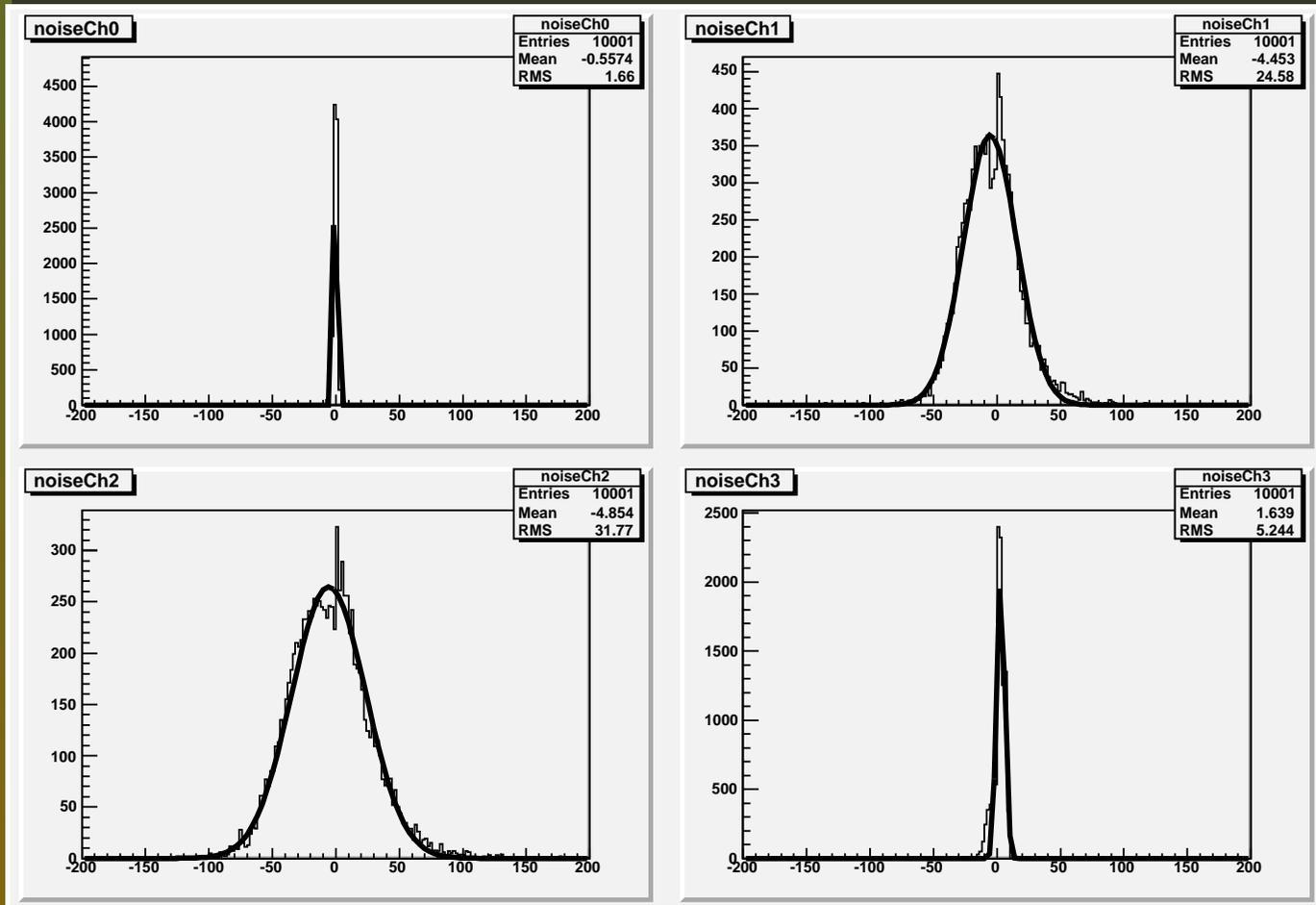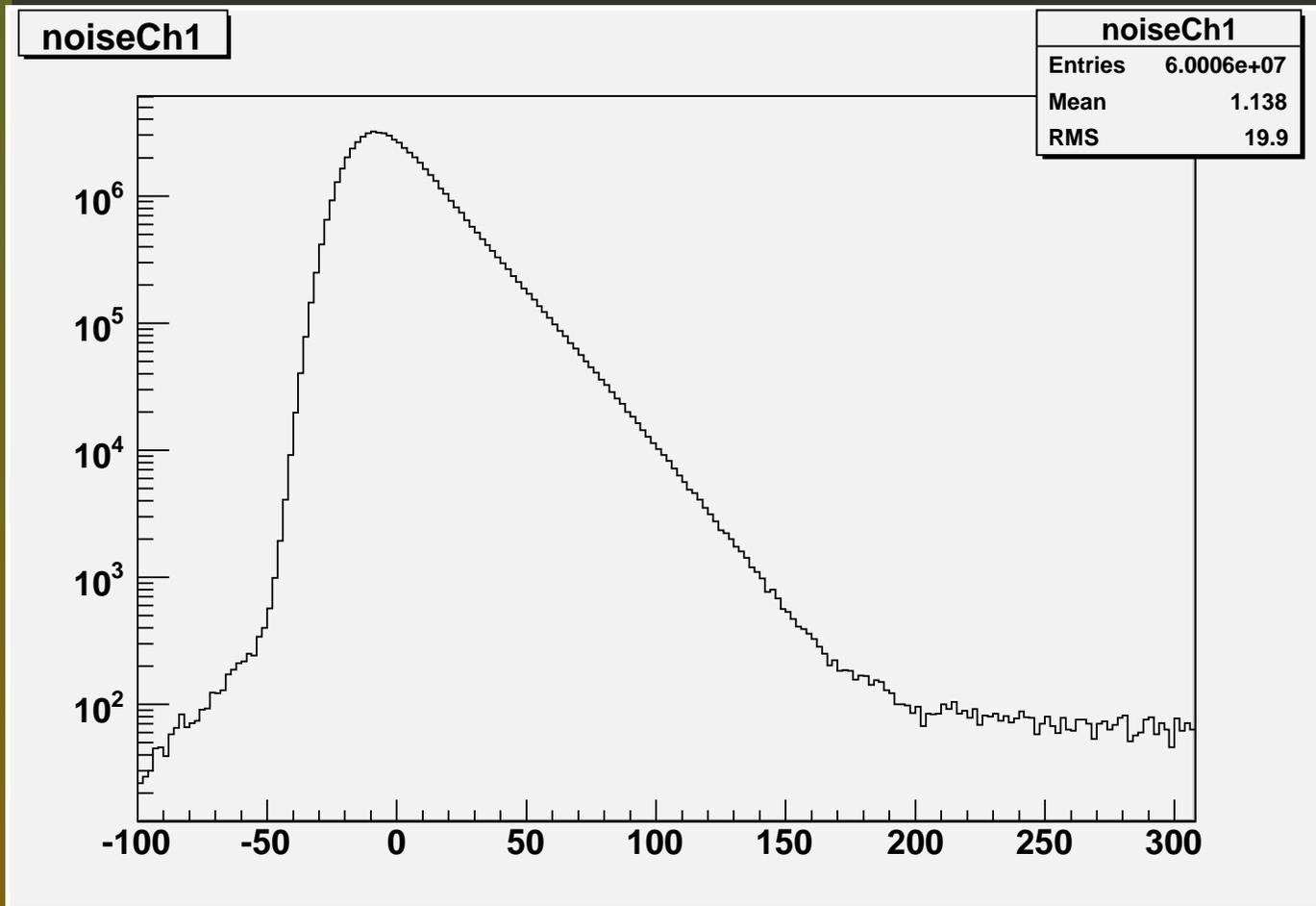
- Ch3 : Empty
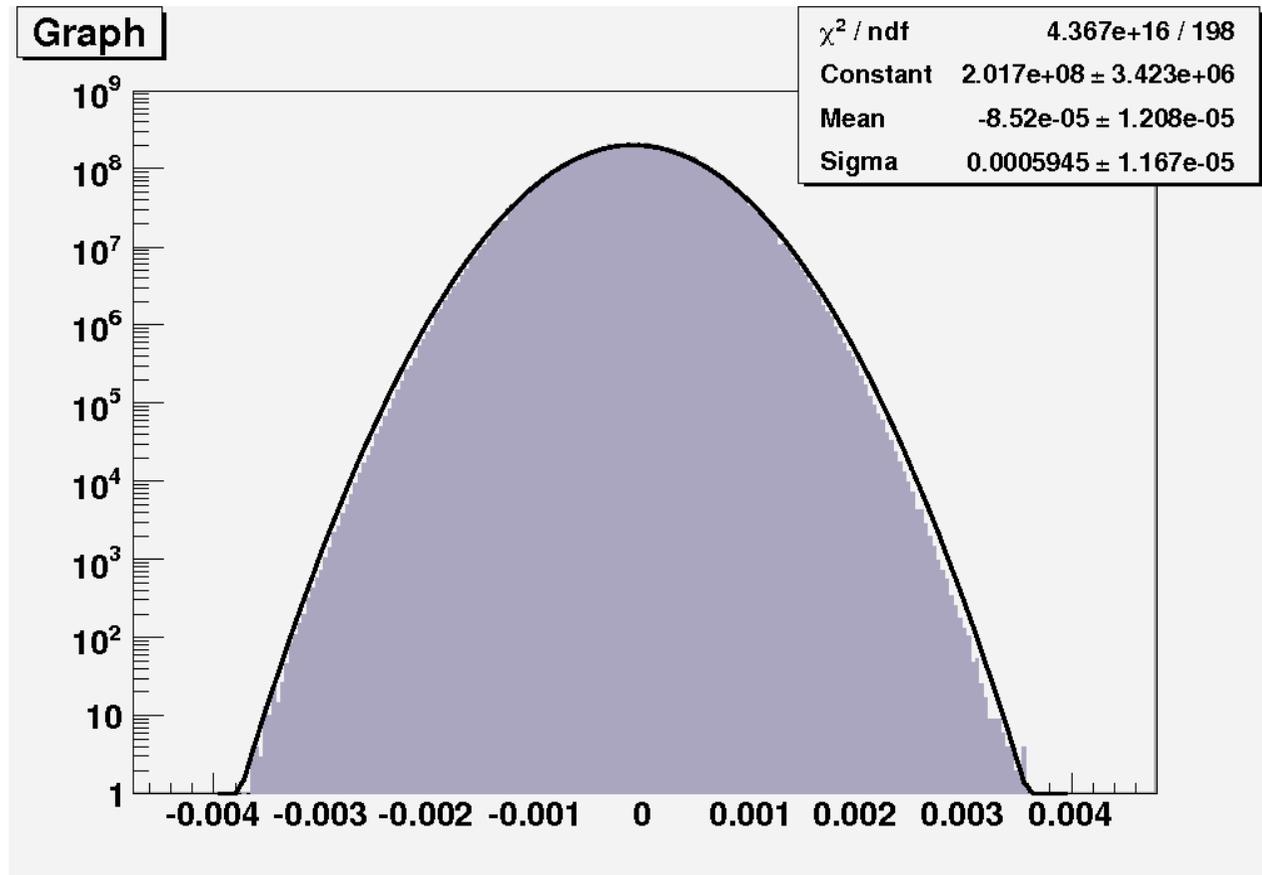
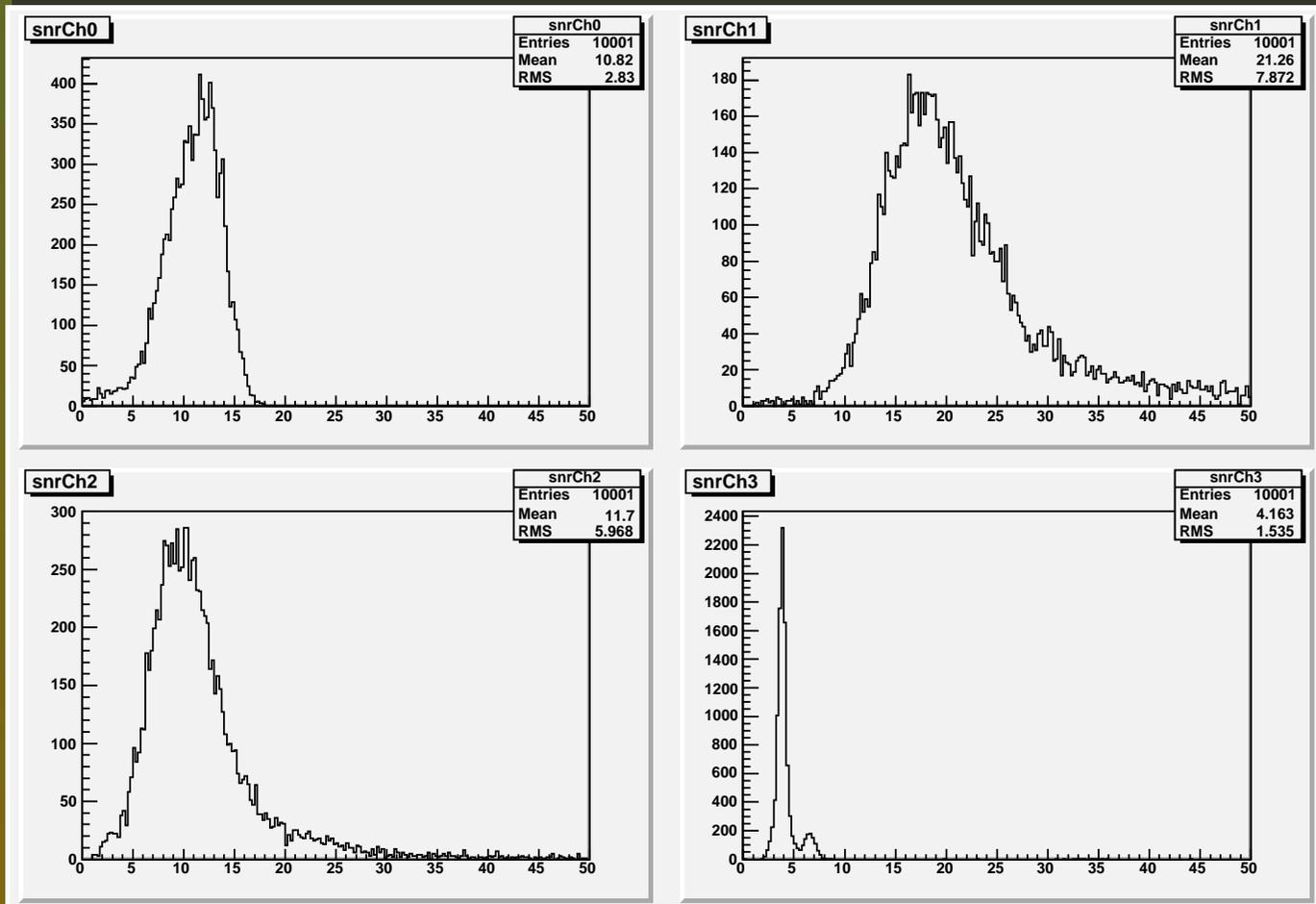# Prevessin

Single event

All event
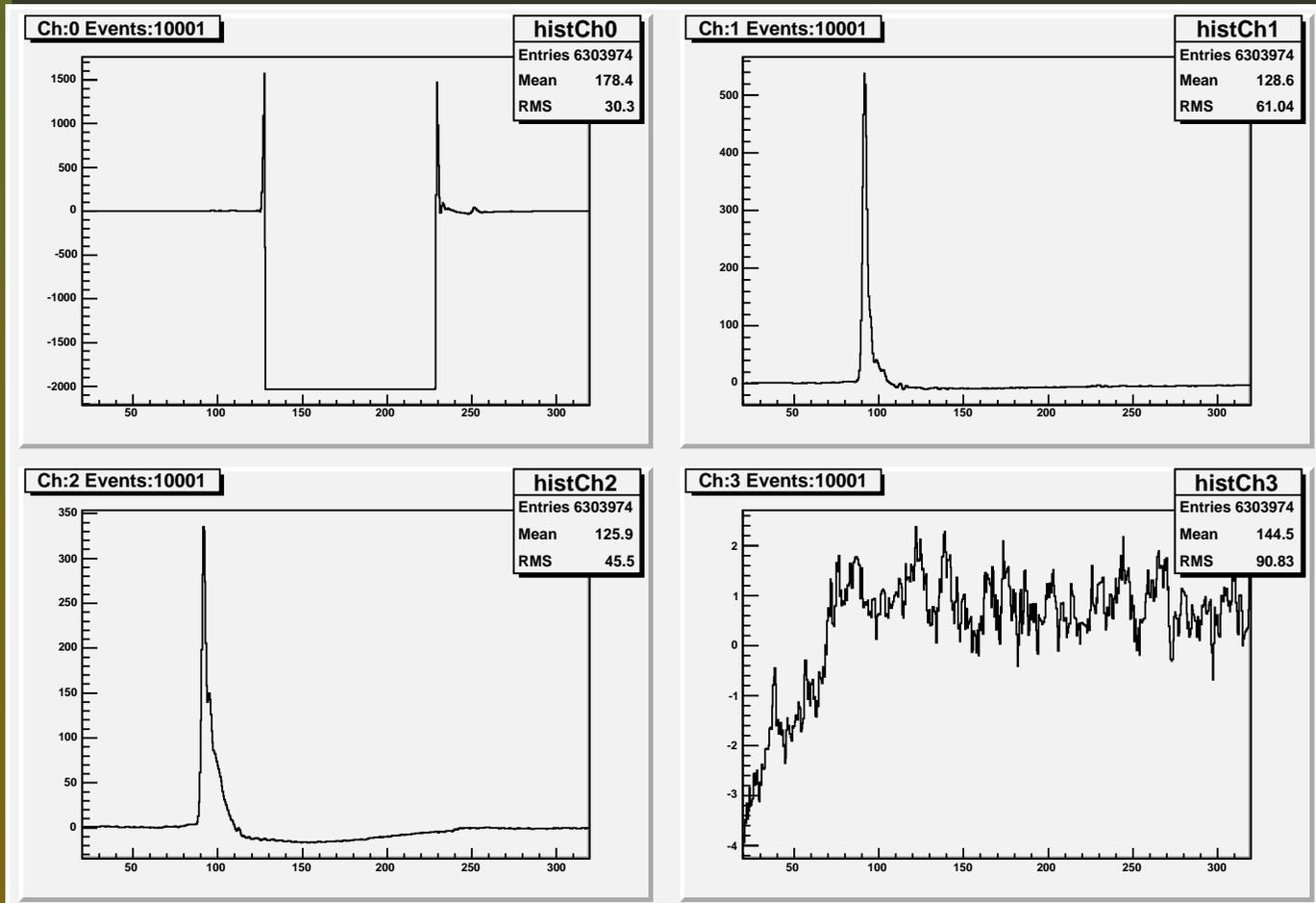
Signal peak
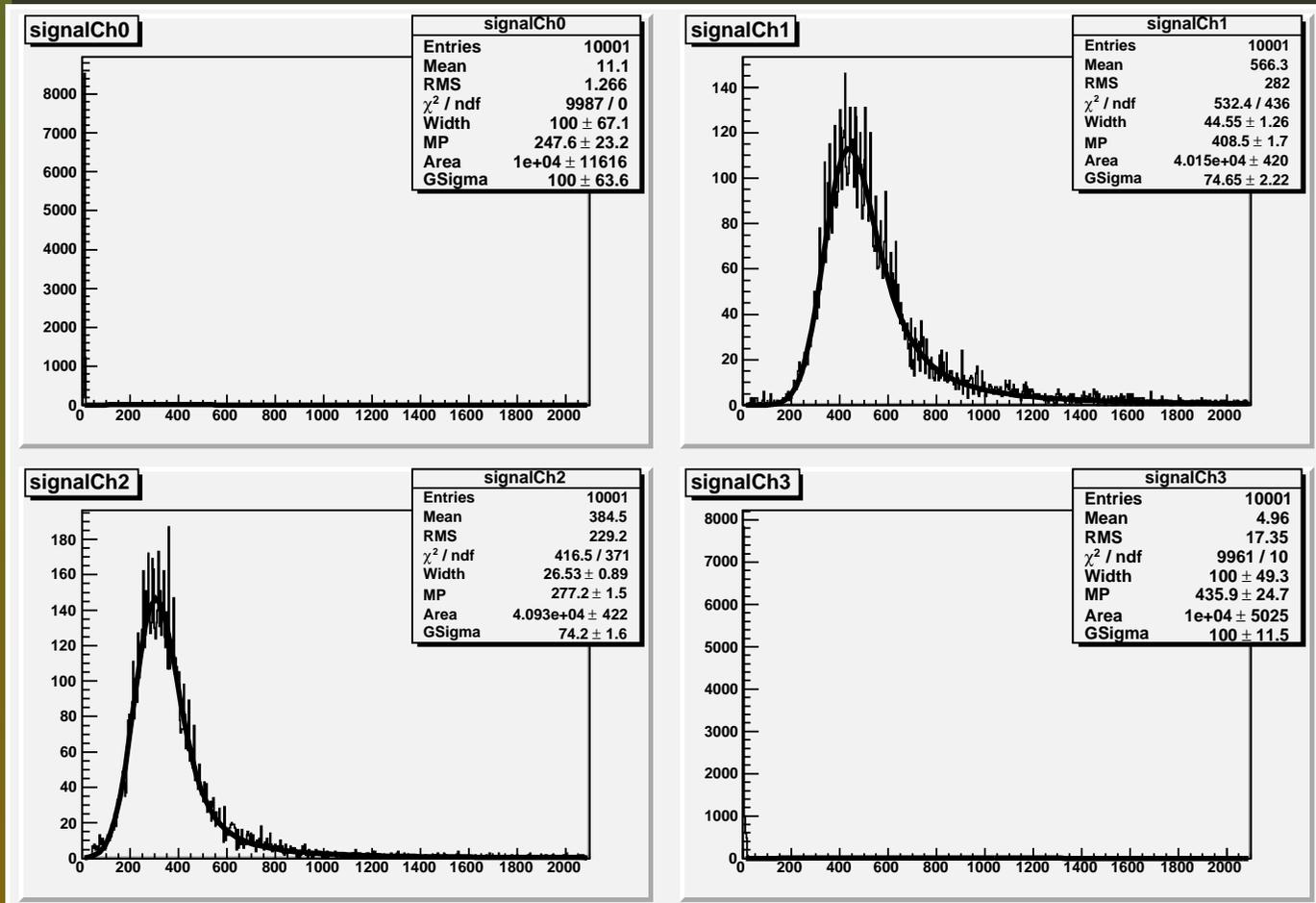
Signal Delay

Noise

Noise

Noise, high stat

Noise, Fotec

SNR

Position scan
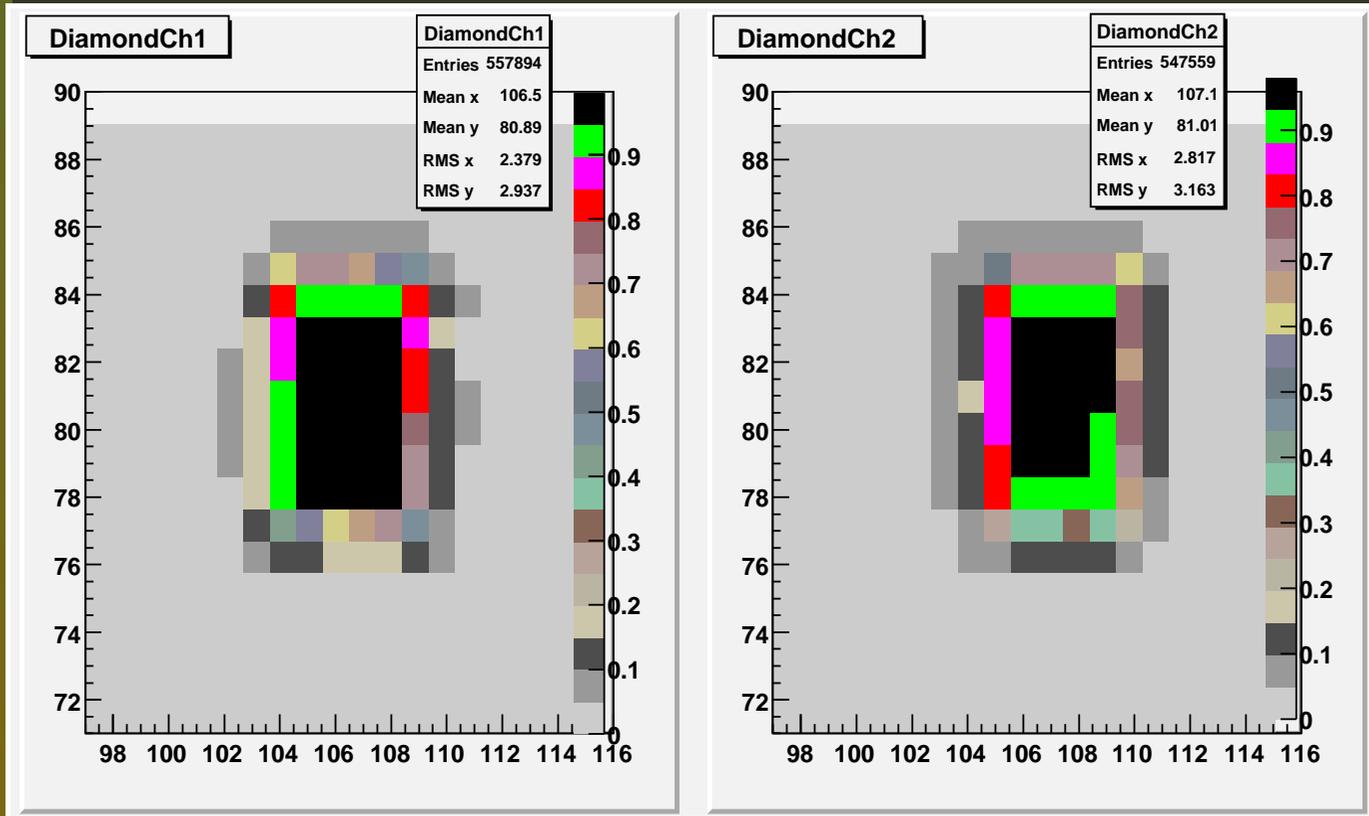
NINO Threshold scan, digital, H8

- Ch0: Fotec $\rightarrow$ NINO#1 $\rightarrow$ ADC

- Ch1: Fotec $\rightarrow$ NINO#2 $\rightarrow$ Attenuator $\rightarrow$ ADC

- Ch2: Fotec $\rightarrow$ NINO#2 $\rightarrow$ Attenuator $\rightarrow$ ADC

- Ch3 : Empty

Single event, Thr=70mV
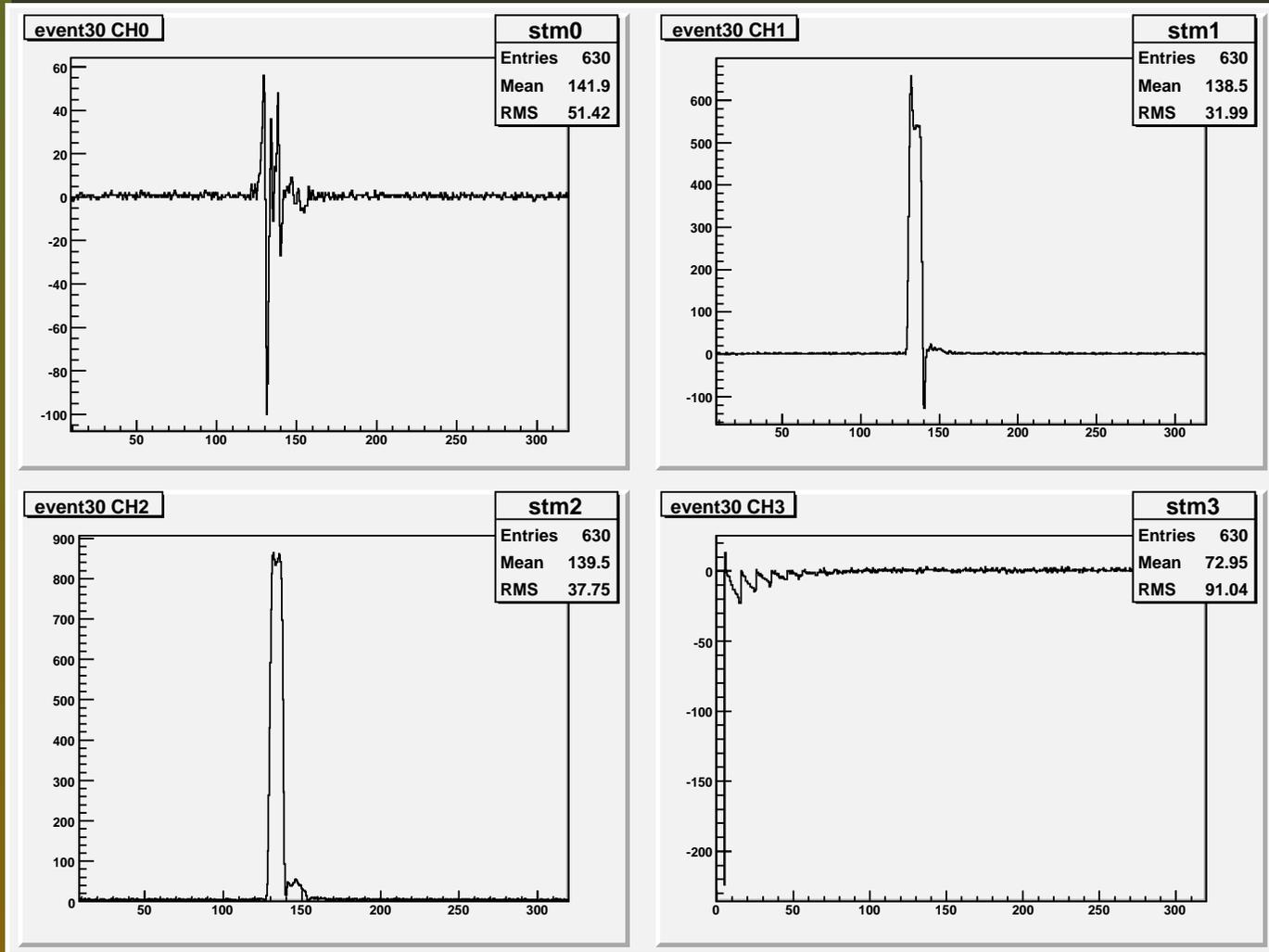
SingleEvent, Thr=20mV

Efficiency