Calorimeter – Recent Updates

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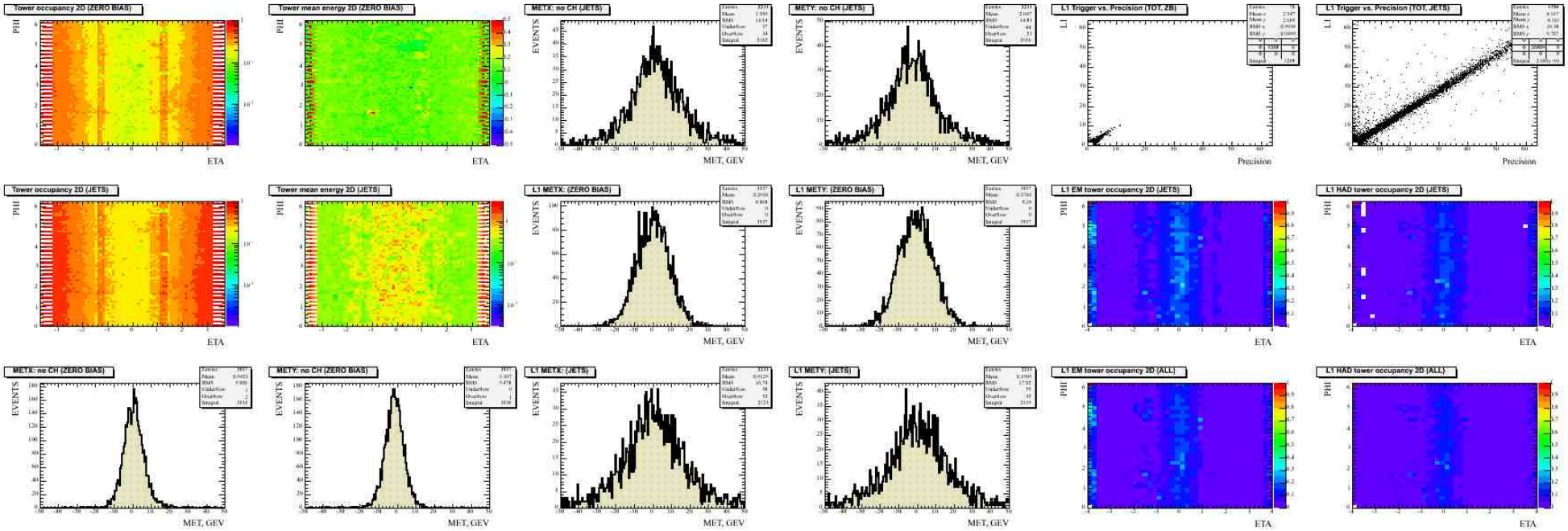
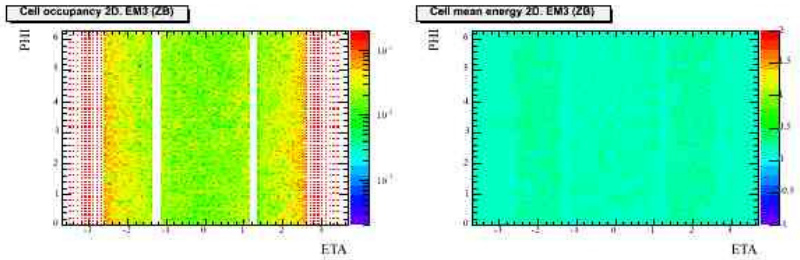
DØ France meeting, June 23 2008

To have a permanent surveillance on the Calorimeter evaluation plots are used to assure correct data taking (dq_calo, dq_monitor)

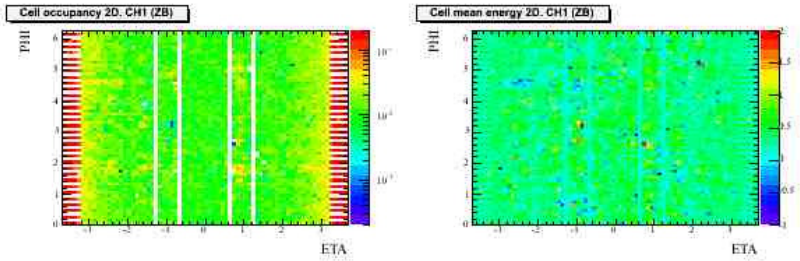


New plots were added to be more sensible to noise problems



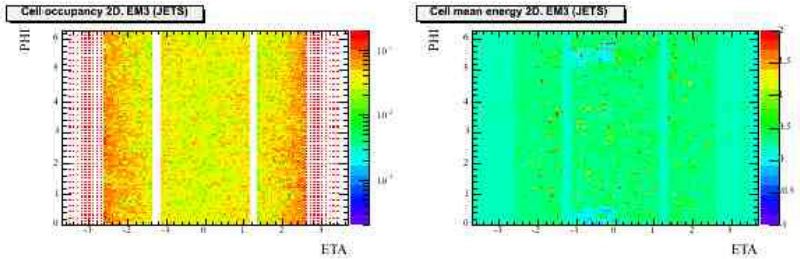
Cell occupancy 2D EM3 (ZB)

Cell mean energy 2D EM3 (ZB)



Cell occupancy 2D CH1 (ZB)

Cell mean energy 2D CH1 (ZB)



Cell occupancy 2D EM3 (Jets)

Cell mean energy 2D EM3 (Jets)

New plots were added to be more sensible to noise problems

Cell occupancy 2D CH1 (ZB)

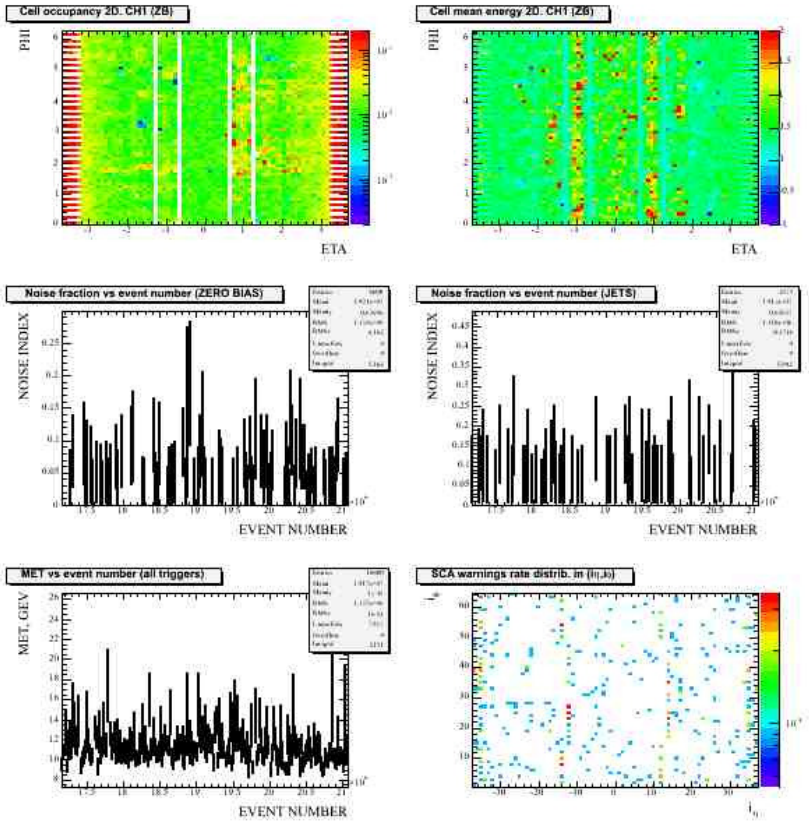
Cell mean energy 2D CH1 (ZB)

(old) Noise fraction vs event number (ZB)

(old) Noise fraction vs event number (Jets)

(old) MET vs event number (all triggers)

(old) SCA warnings

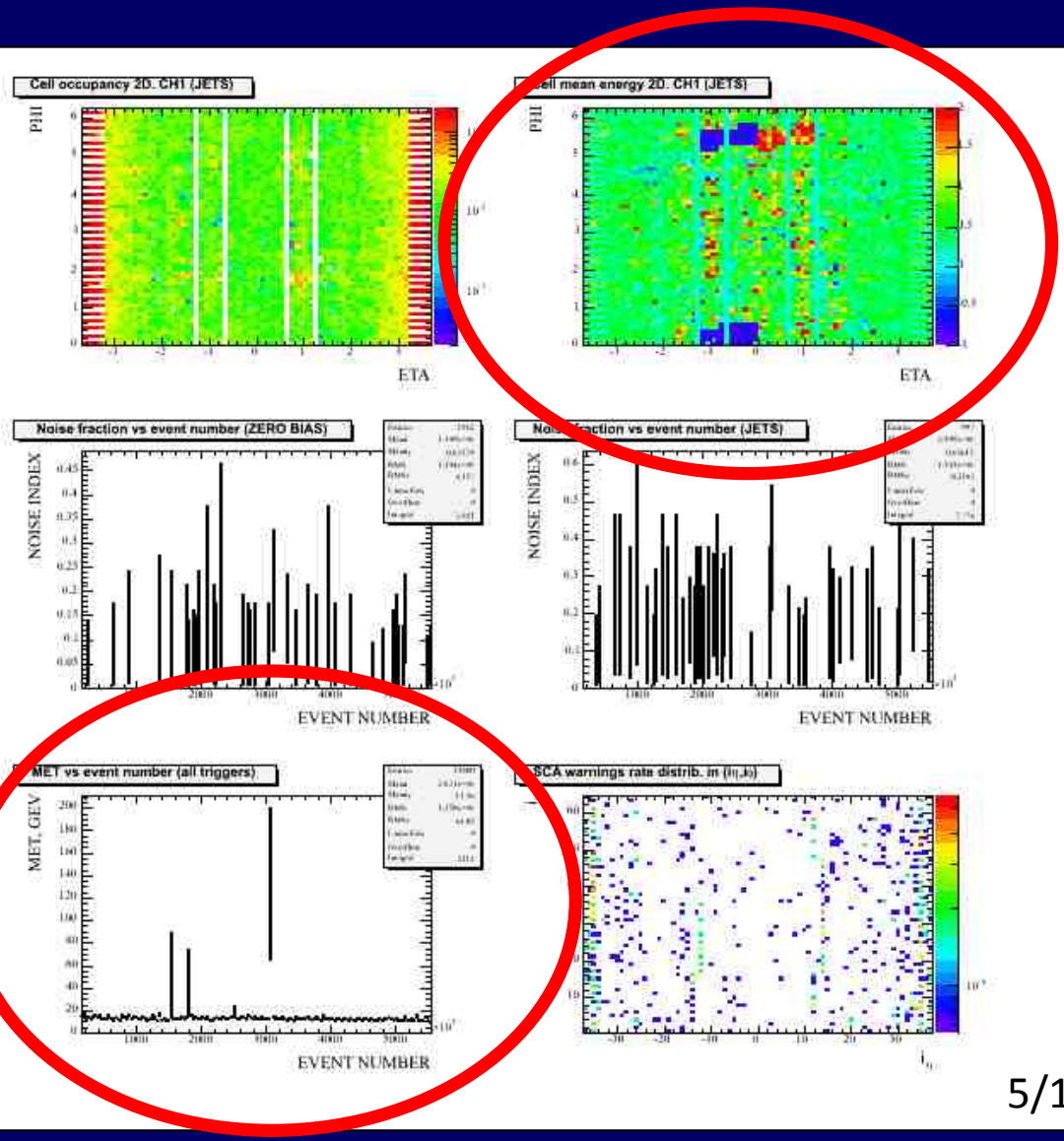


CAL

And indeed the new plots showed first evidence of the Crate 9 Noise problem (blue) that occured last week (I was the on call CAL expert). Crate 8 is partly red in these plots (not correlated to blue noise, disappeared).

The problem first occured during my owl shift on

Friday 13th



Unknown characteristics of the new noise made the analysis difficult.
Noise was not present in all the runs.

The problem turned out to be due to an unstable +5V low voltage in the BLS fanout control for crate 9.

We fixed it in an controlled access by exchanging the BLS fanout control unit last Wednesday.

➔ **Better tools pay off!**

b Jet Energy Resolution

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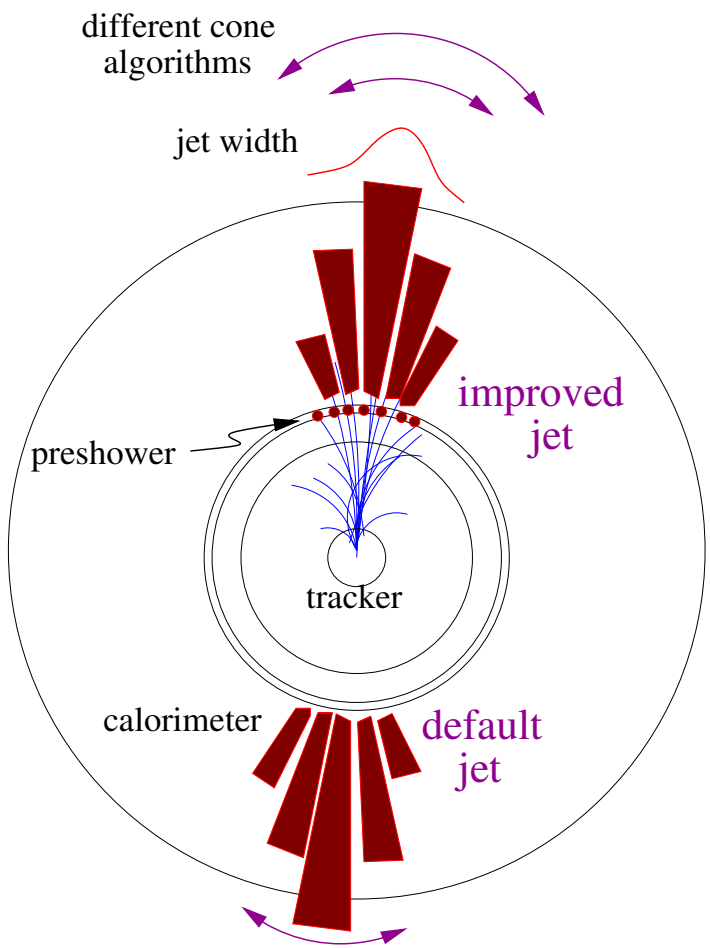
Outline

- Overview Jet Resolution
- b jet smearing
  - Motivation
  - b jet pT Asymmetry (Def)
  - Comparison DATA - MC
  - Next steps

Overview Jet Resolution



b jet energy resolution - Motivation

- AIM: "JSSR for b jets"
- Jet Smearing for b jets

➔Measure the **b jet energy resolution**

- pT asymmetry fitting for DATA + MC
- determine smearing functions
- create a processor for b jet smearing

pT asymmetry (Def.)

$$pT_{asy} := \frac{pT_1 - pT_2}{pT_1 + pT_2}$$

pT_1 and pT_2 are determined by the following criterion

$$|rapidity(jet\,1)| < |rapidity(jet\,2)|$$

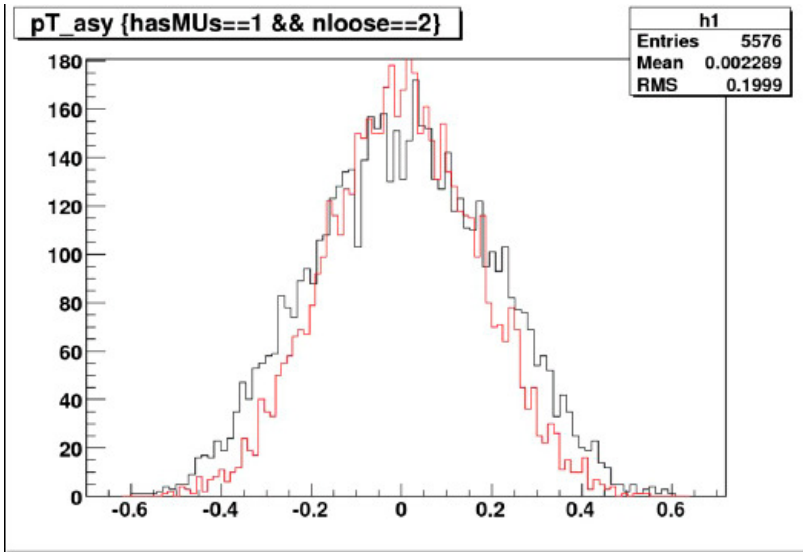
cf. note by Mikko Voutilainen (DZERO Note 005499)

pT asymmetry: First attempt

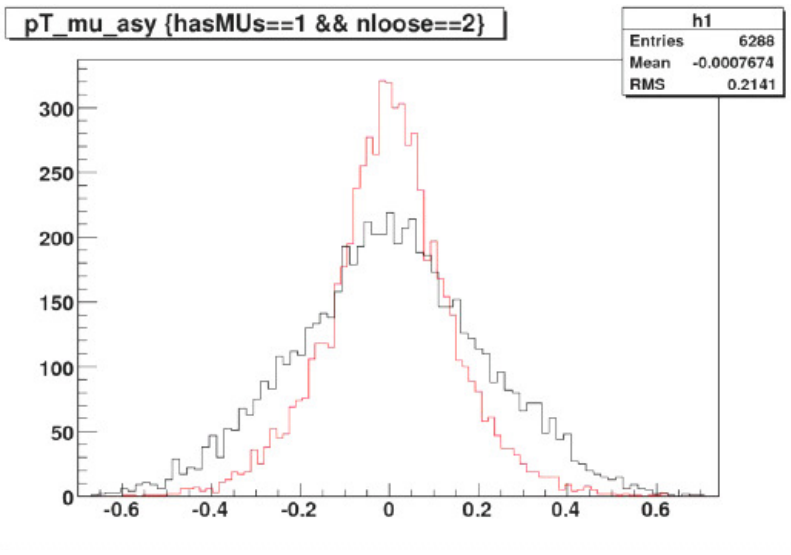
First attempt: p17 DATA/MC test samples (bID skim)

Plot the pT asymmetry over the full pT range

DATA



MC



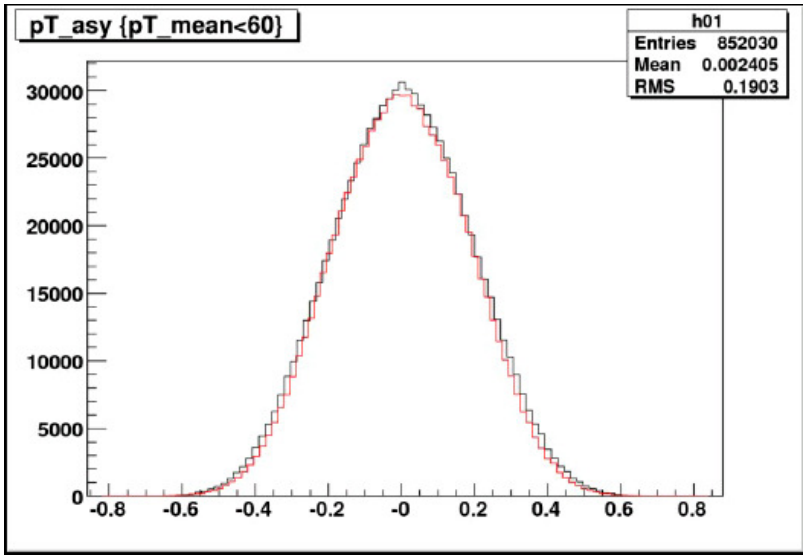
Black: JES Red: JESMU

pT asymmetry: Fitting

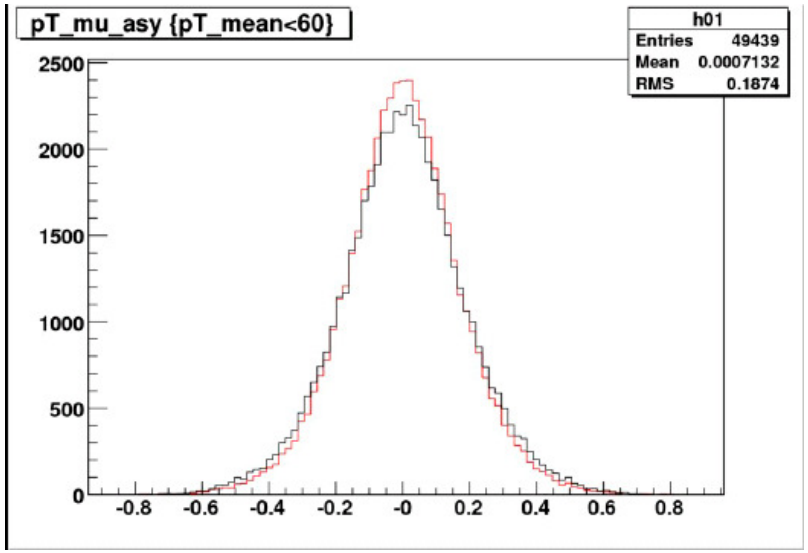
→Use refined binning!

pT_mean < 60 GeV

DATA



MC



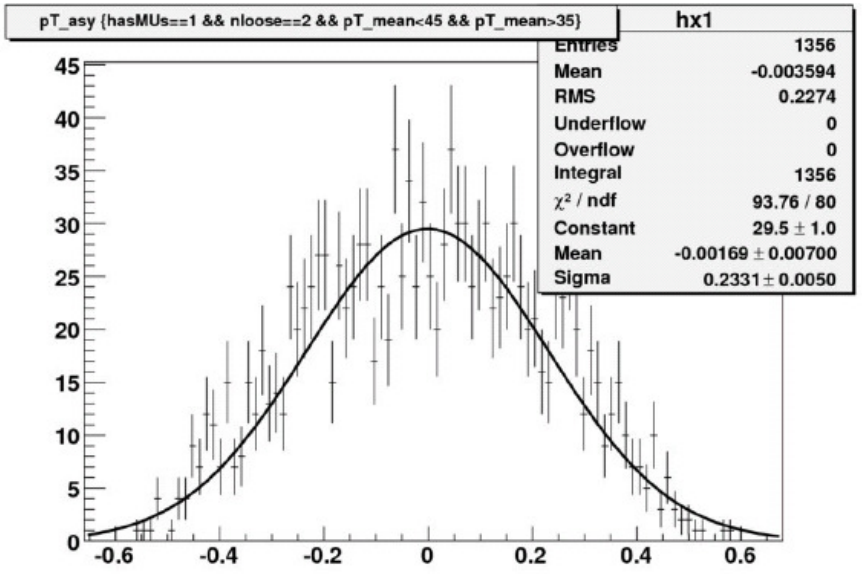
Black: JES Red: JESMU

pT asymmetry: Fitting

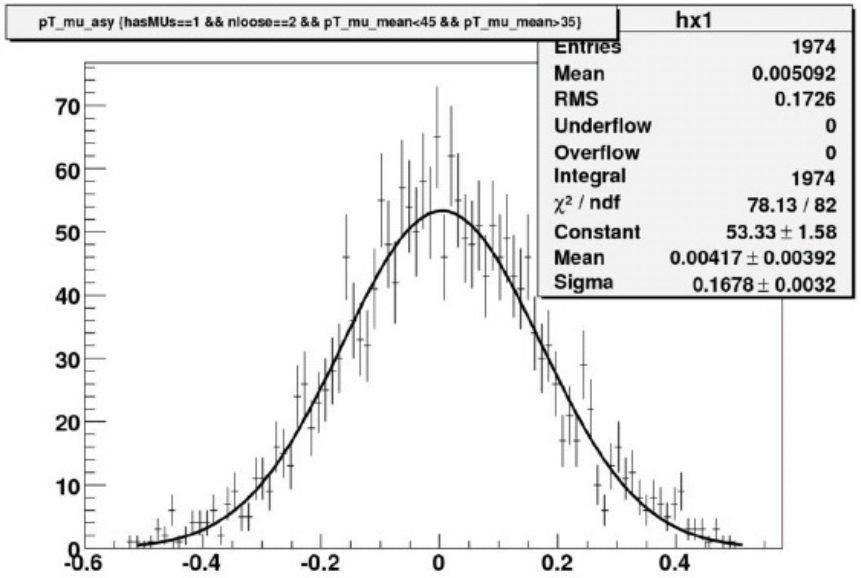
→ **Fit** in small bins!

For these plots we ask for: 1 muon, 2 loose tags, 35 GeV < pT_mean < 45 GeV

DATA



MC



Gaussian fits in [-3 RMS, +3 RMS]

Jet Smearing

Estimate the energy resolution of the b Jets

Calculate the difference at the energy of the jet

$$\sigma_{DIFF}(E_{jet}) = \sqrt{\sigma_{DATA}^{2}(E_{jet}) - \sigma_{MC}^{2}(E_{jet})}$$

Smear Jets with a Gaussian distribution $G(E_{jet}, 0, \sigma_{diff})$

$$p^{'\mu} = p^{\mu} \times [1 + G(E_{jet}, 0, \sigma_{diff})]$$

Next steps

➔First fitting attempt shows pT asymmetry for b jets is fittable

Next steps:

→ Create a bigger skim (whole p20 two NN tight b tags)

→ Fit the pT asymmetry

→ Determine smearing functions for DATA and MC

→ **Create a smearing processor for b jets based on these functions**