Calgo-Workshop (11-12 May)

- **Short term goals:**

  - "produce" better/ uniform data with Fix pass-2

  - Recommend set of cuts/ data samples/ procedures for the first round of publications

  - Improve calibrations/ resolutions/ error (em/ jet)

Longer term goals

  - Finalize / Certify p17 which has the tools (DB, new info on tmb) to allow a further step in reconstruction quality.

  - keep improving algorithms using this new info

Status of the on-going efforts will be reviewed in Fresno

Calgo-Workshop (11-12 May)

tuesday	10:30-	Introduction / Reviews (Hurricane Deck)	Ursula Bassler/Gregorio Bernardi
	13:30-	Electron - id/calibration (Hurricane Deck)	Jan Stark/Jon Hays
	15:30-	Photon-Id & PreShowers (Hurricane Deck)	Drew Alton/Yurii Maravin/ Abid Patwa
	17:00-	Jet-Id (Hurricane Deck)	Bob Kehoe/Slava Kulik
wednesday	08:30-	Jet Energy Scale (Hurricane Deck)	Ia Iashvilli/Nirmalya Parua
	10:45-	MET and dOcorrect (Hurricane Deck)	Sophie Trincaz/Patrice Verdier
	13:00-	Energy Flow (Hurricane Deck)	Anna Goussiou/Aril Schwartzman
	14:15-	CALOP (Hurricane Deck)	Pierre Petroff/Robert Zitoun
	16:30-	ICD/MG (Hurricane Deck)	Vivian O'Dell/Andy White

54 talks in 2 days + a few gallons of coffee

Calgo-Workshop (11-12 May)

General / Review ←

Electron - id/calibration ←

Photon-Id/ PreShowers → future ADM?

Jet-Id ←

Jet Energy Scale → future ADM?

MET and d0correct ←

Energy Flow ←

CALOP → future ADM?

ICD/MG → future ADM?

Too much material → try to concentrate on studies and changes which are directly influencing current analyses

Electrons / Photons / PS / calibration

12:00	Fast Simulation Status Report (15') (transparencies)	Junjie Zhu
12:15	Phi intercalibration (15') (transparencies)	Lei Wang

Electron - id/calibration (13:30->15:15)
Chair: Jan Stark/Jon Hays
Room: Hurricane Deck

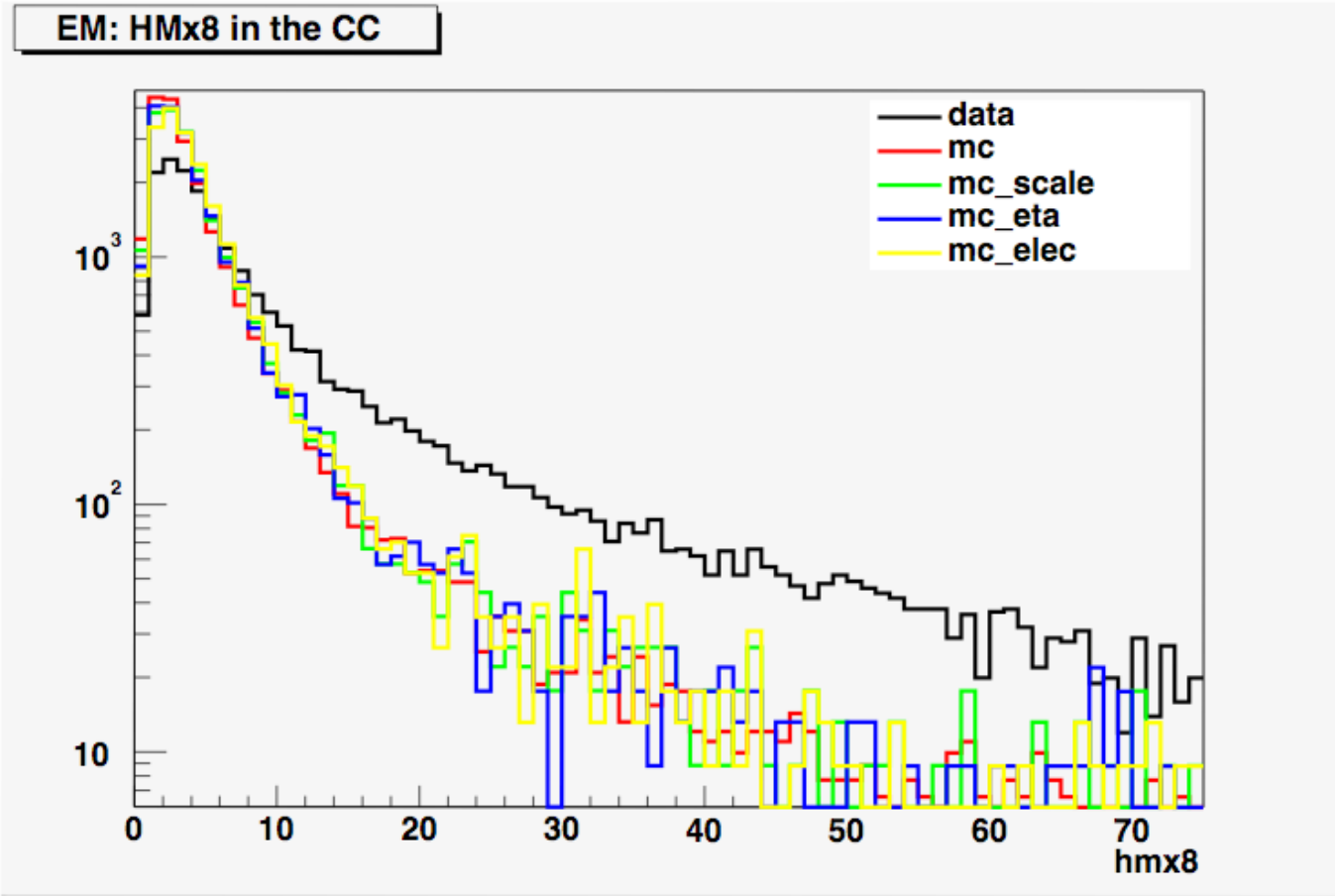
13:30	EM Scale Study using J/Psi->ee (15') (transparencies)	Smain Kermiche
14:00	Electron Shower Shapes (15') (transparencies)	Jovan Mitrevski
14:15	Electron likelihood (15') (transparencies)	Joe Kozminski (Bob Kehoe)
14:30	Electrons in the ICR (15') (transparencies)	Ming Yan
14:45	Energy Scale Studies (20') (transparencies)	Junjie Zhu

Photon-Id & PreShowers (15:30->16:45)
Chair: Drew Alton/Yurii Maravin/ Abid Patwa
Room: Hurricane Deck

15:30	Preshower energy for EM objects (10') (transparencies)	Alton, D
15:40	Database issues for PS (10') (transparencies)	Patwa, A
15:50	Preshower Software for p17 (10') (transparencies)	Magerkurth, A
16:00	Pi0s and photon id (40') (transparencies)	Maravin, Y

EM-Shower Shape Studies

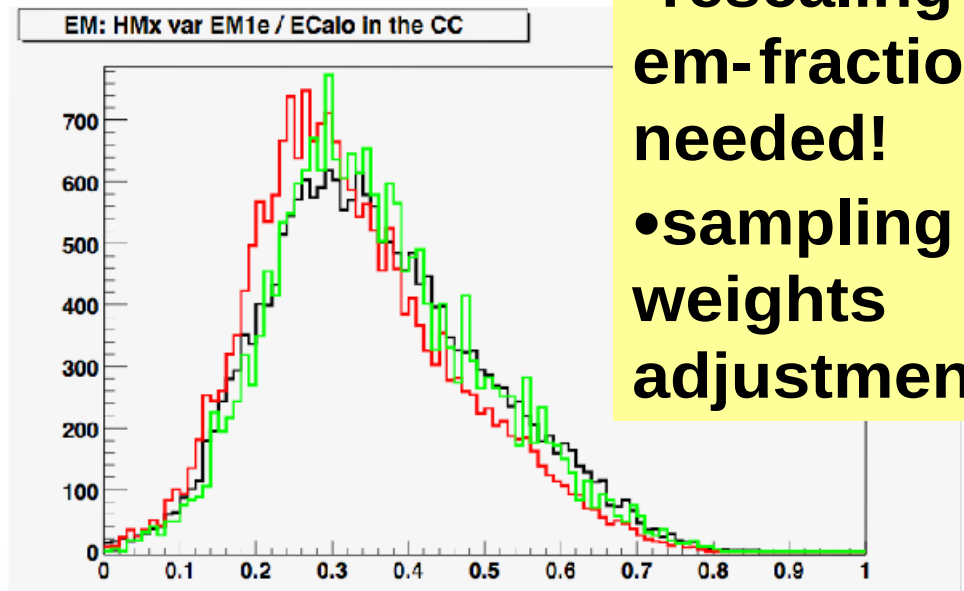
- disagreement data/MC in Hmx8 → Hmx7 is default
  particularly shower shape in eta (sigZorR variable)
- simulation of possible Cross-talk effects

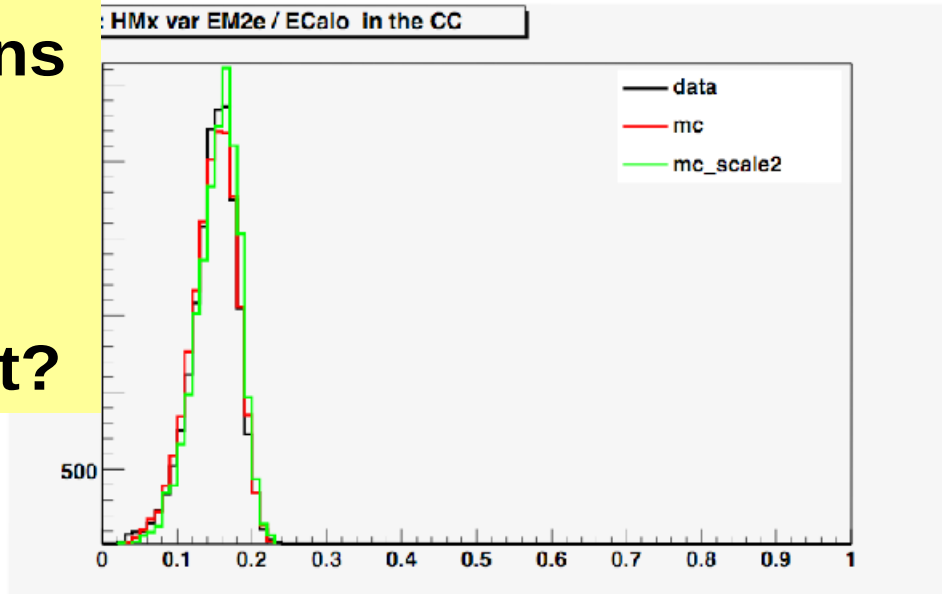


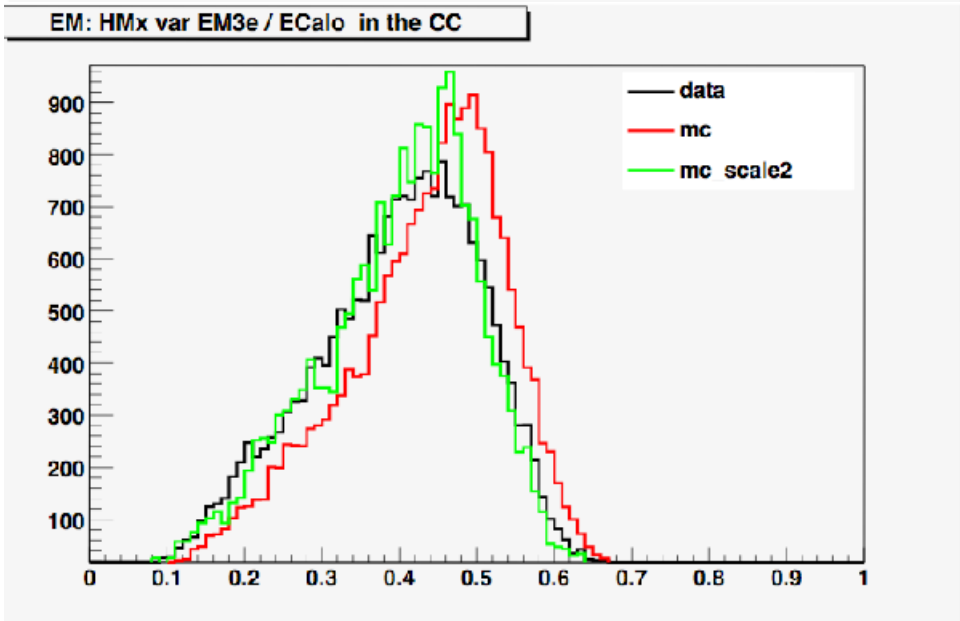
G. Bernardi
for CALGO

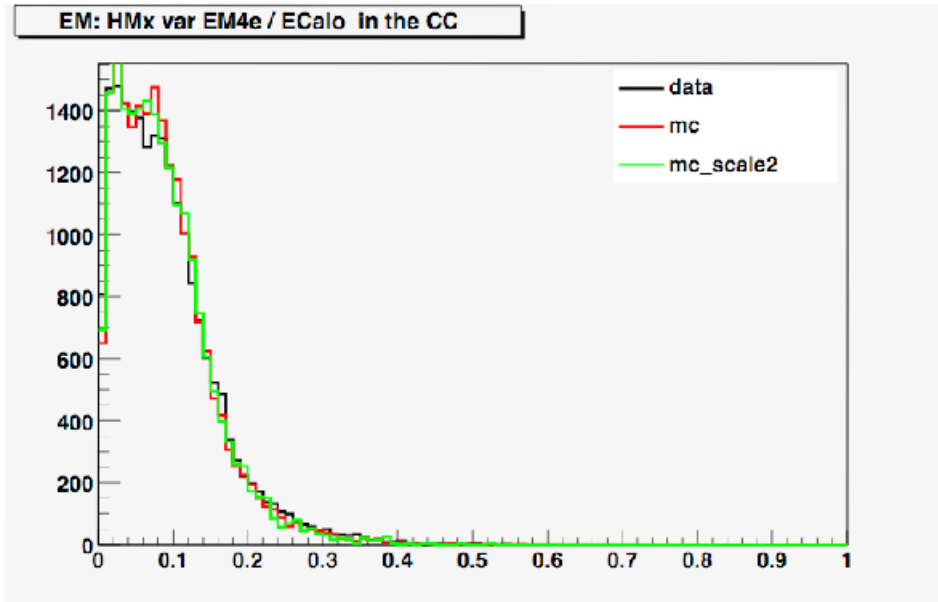
em: longitudinal shower profile

- rescaling of em-fractions needed!
- sampling weights adjustment?



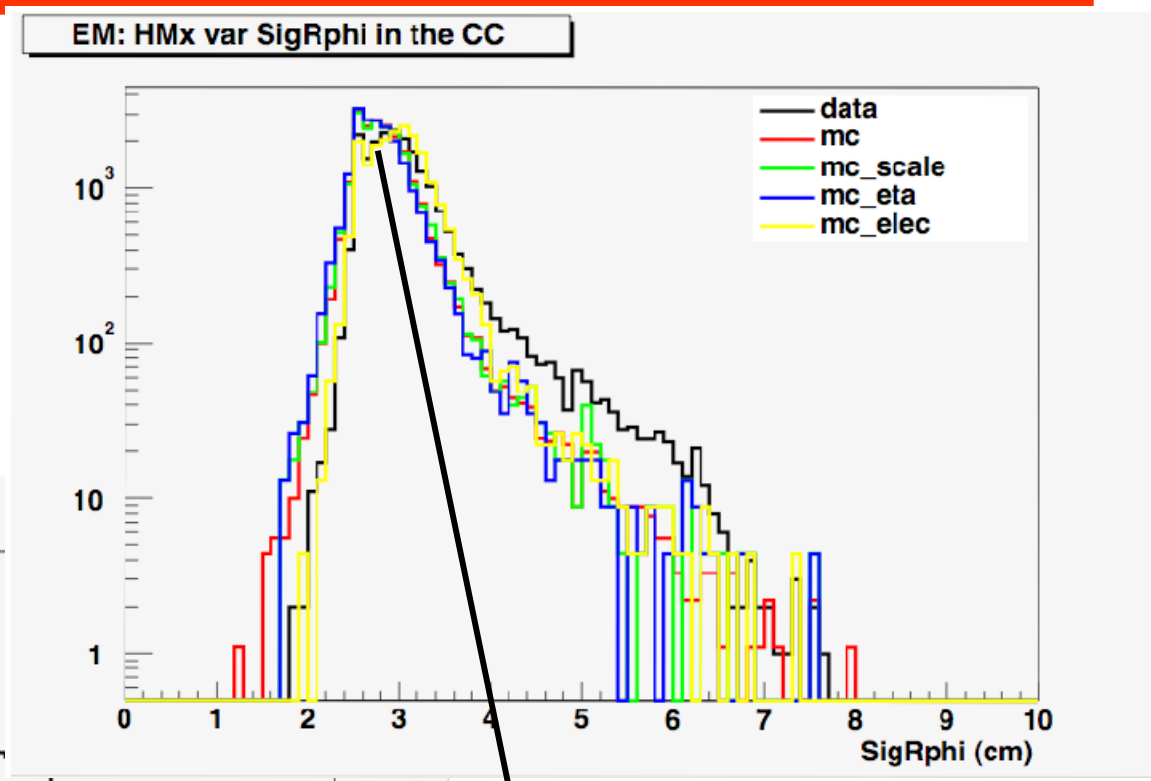


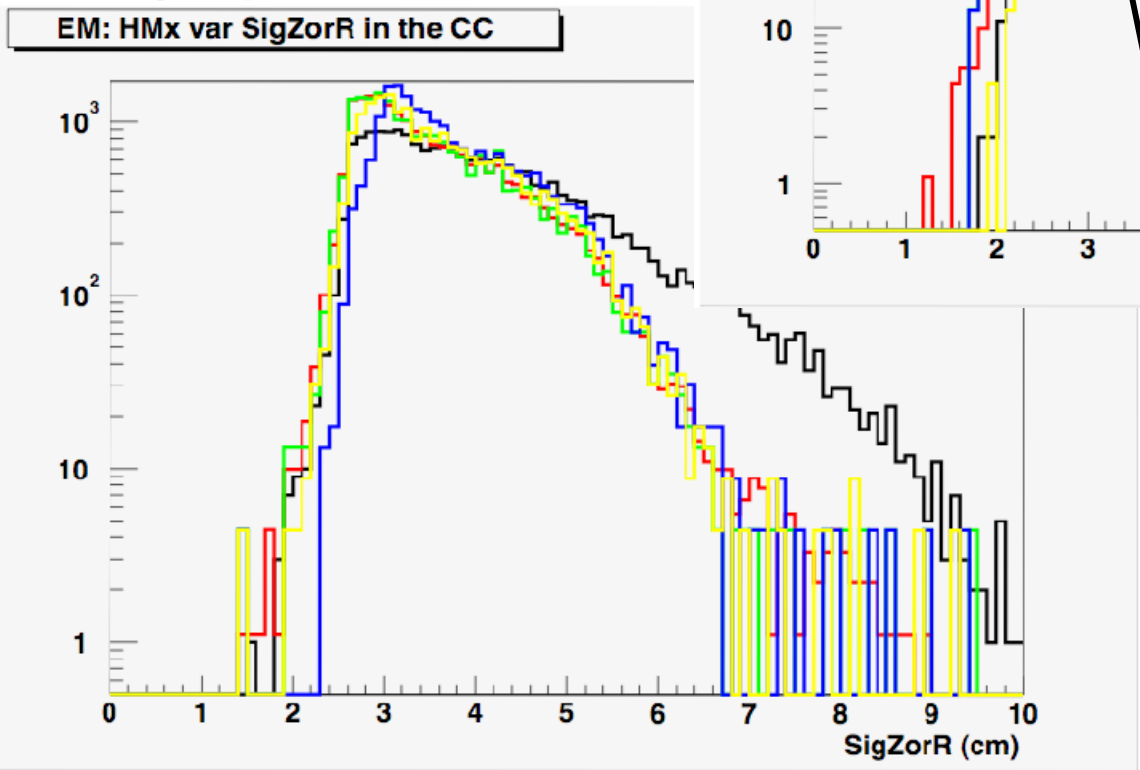




Shower shape in eta/phi

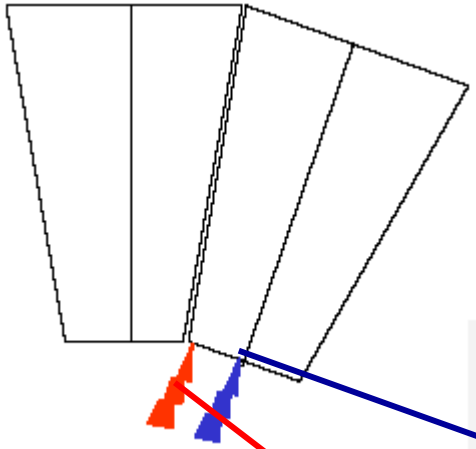
- 1% cross-talk in eta (read-out strips)
- 1% electronics cross-talk (per tower in depth)



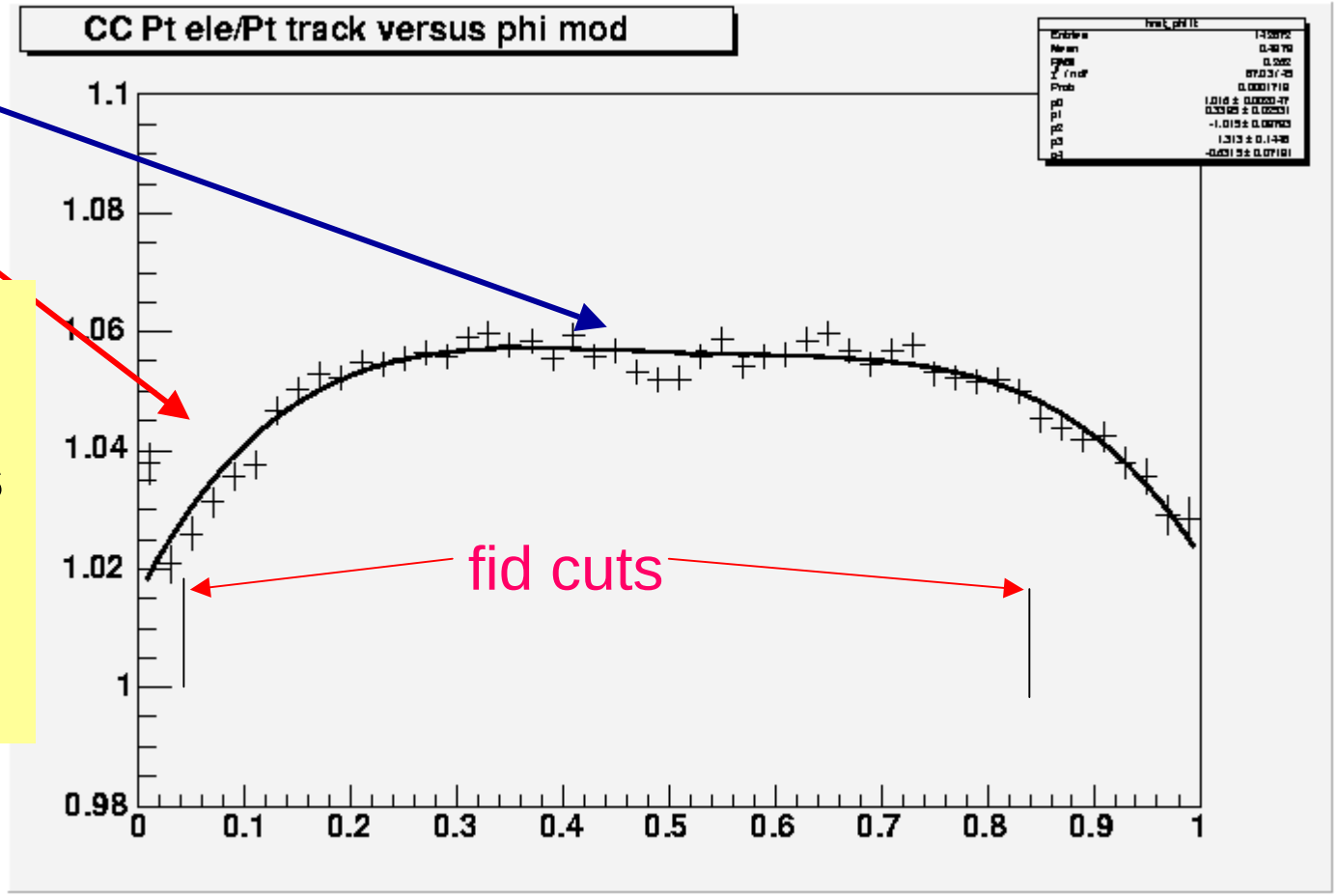


Electronics crosstalk helps here

Electron reconstruction in phi-cracks



E/p study with e+- from W/Z

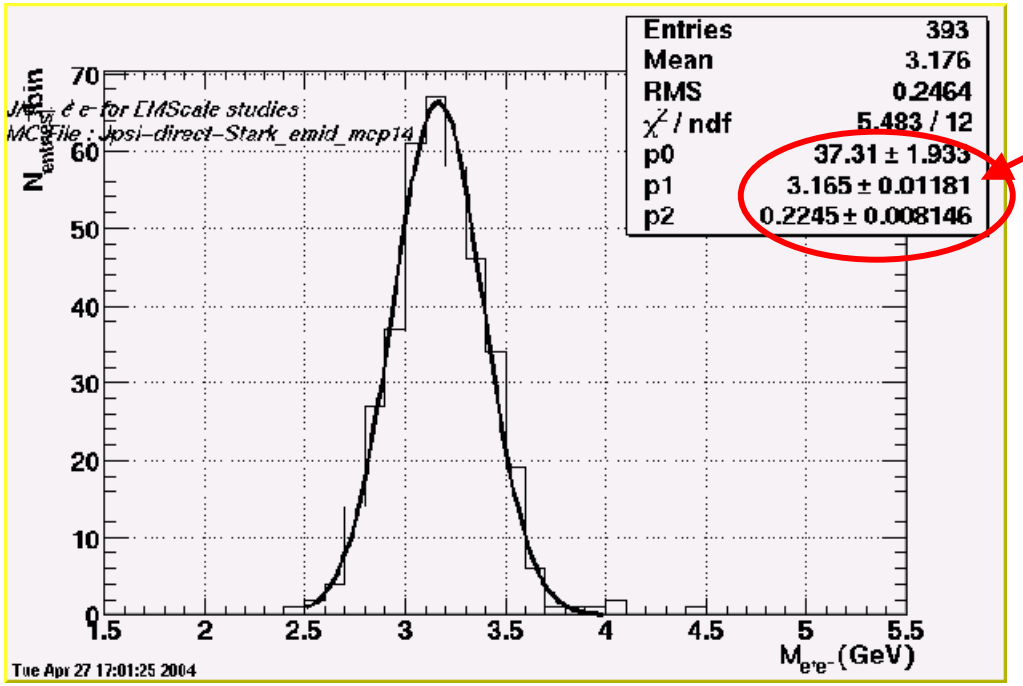


better crack simulation needed → less charge collected in Run II

J/Psi calibration: MC sample and fit

File → TMBAnalyse_x-p14.05.02-d0correctv06-p14.03.00_Stark_emid_mcp14

(direct J/ψ events) The trigger was simulated with TrigSim in p15.06.01



After geometrical corrections

Mass = 3.165 ± 0.012

Width = 0.2245 ± 0.008

13275 events

L3 Bit On

≥ 2 EM objects

Isolation : ISO ≤ 0.15

EM Fraction : f ≥0.9

Hmx7 <12 (||Hmx8 <20)

Fiducial cuts

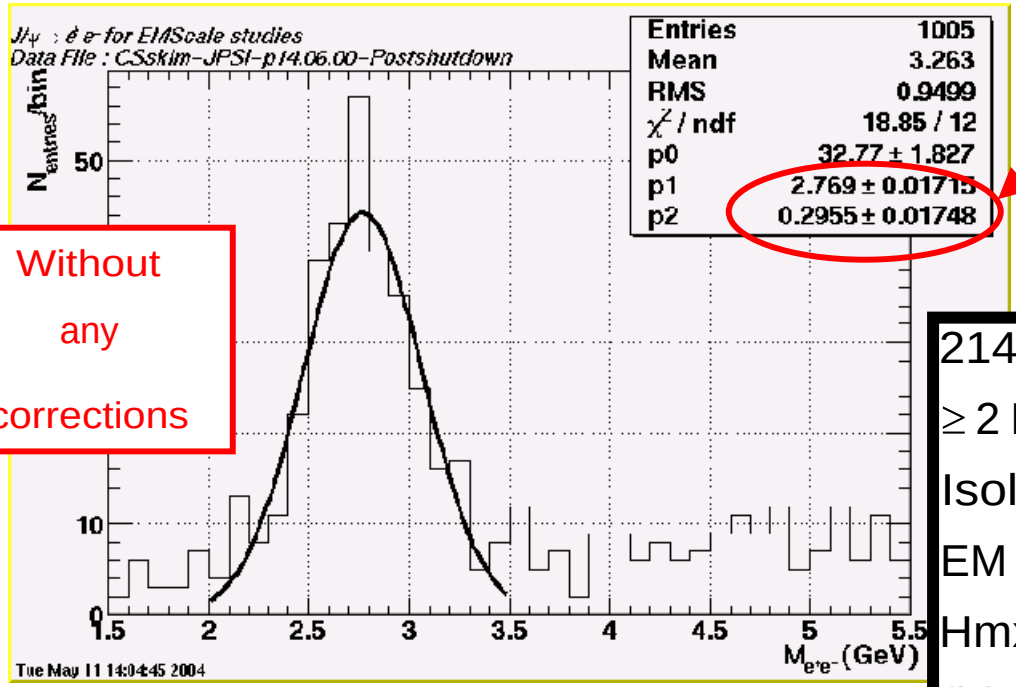
At least 1 EMO track matched

⇒ 393 events

G. Bernardi
for CALGO

J/Psi calibration: MC sample and fit

All Files on SAM → CSskim-JPSI.raw_p14.06.00 (~ 70 % of the skim)



Mass $= 2.769 \pm 0.017$

Width $= 0.295 \pm 0.017$

Without any corrections

2144839 events

$\geq$ 2 EM objects

Isolation : ISO ≤ 0.15

EM Fraction : f ≥ 0.9

Hmx7 <12 (& & Hmx8 <20)

fiducial cuts

At least 1 EMO track matched

$\Rightarrow$ 1005 events (~ 330 under the peak)

The calibration constants are obtained using the energy corrections for geometry effects for electrons.

EMScale constants J/Psi vs Z → ee

Only CC is considered, due to low statistics only 4 eta CC zones were defined :

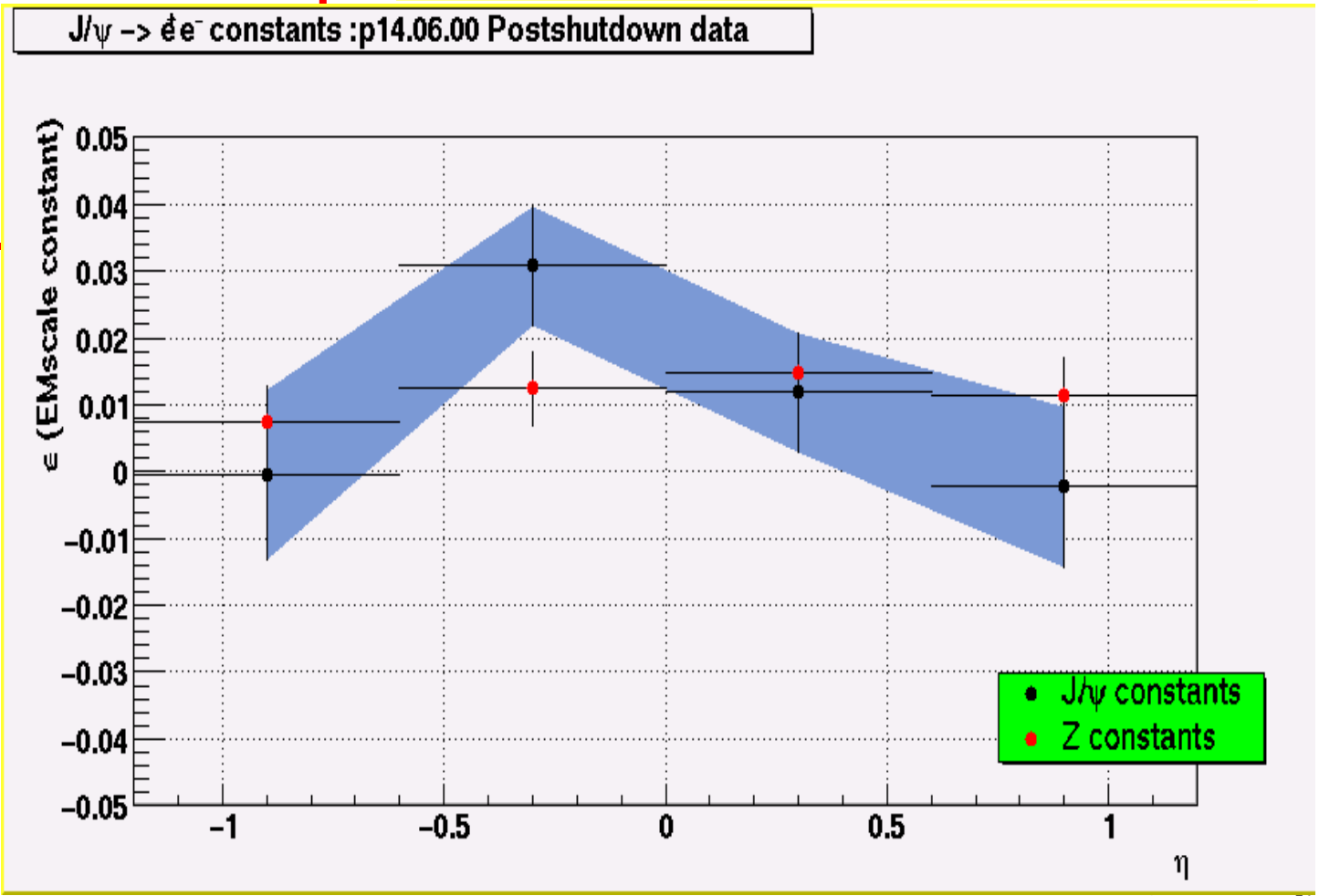
Zone 1 : $-1.2 < \eta < -0.6$

Zone 2 : $-0.6 < \eta < 0.0$

Zone 3 : $0.0 < \eta < 0.6$

Zone 4 : $0.6 < \eta < 1.2$

no important non-linearity effect!



N EM obj/zone:

Zone 1 : 102

Zone 2 : 219

Zone 3 : 215

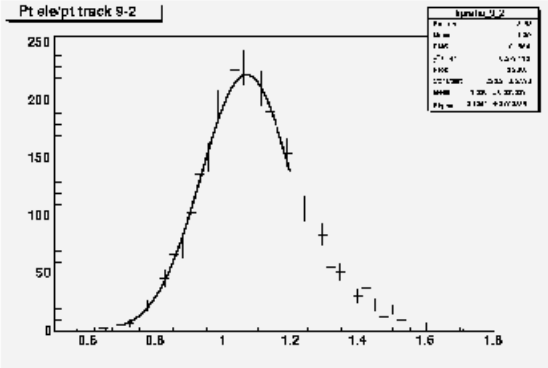
Zone 4 : 114

electrons to scan electronics behavior

in CC

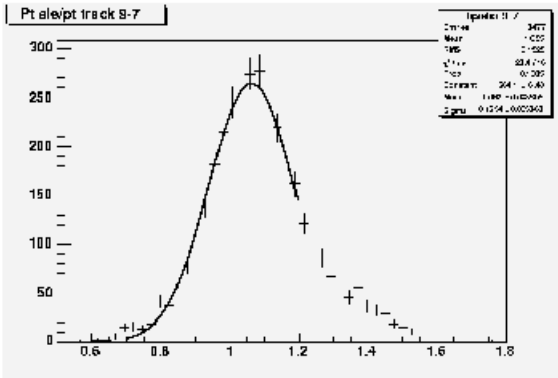
e+- from W/Z

In agreement with Jan's study with e from Z
Here, higher statistics

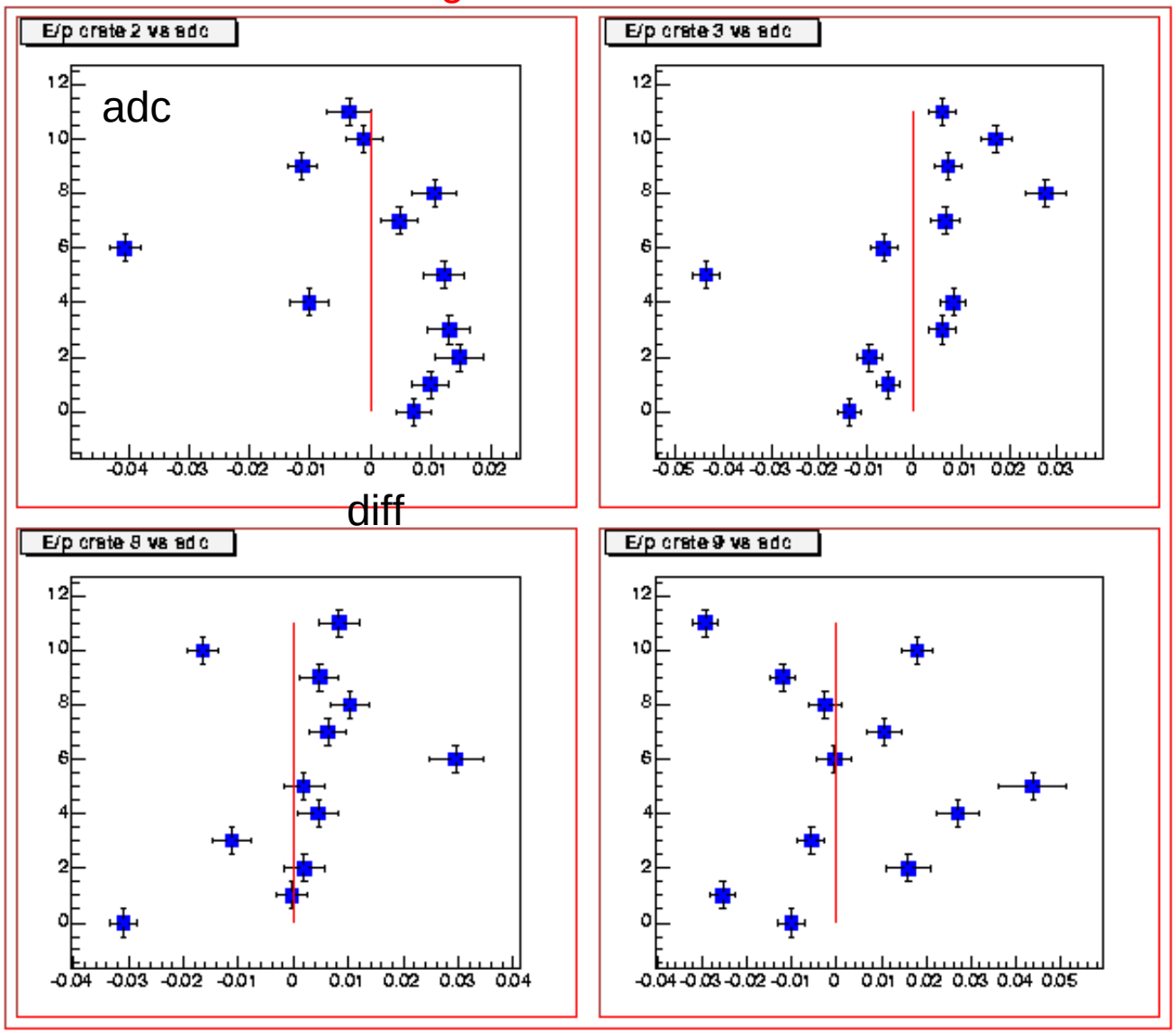


adc 2

E/p gaussian fit crate 9
~3000 evts/adc



adc 7

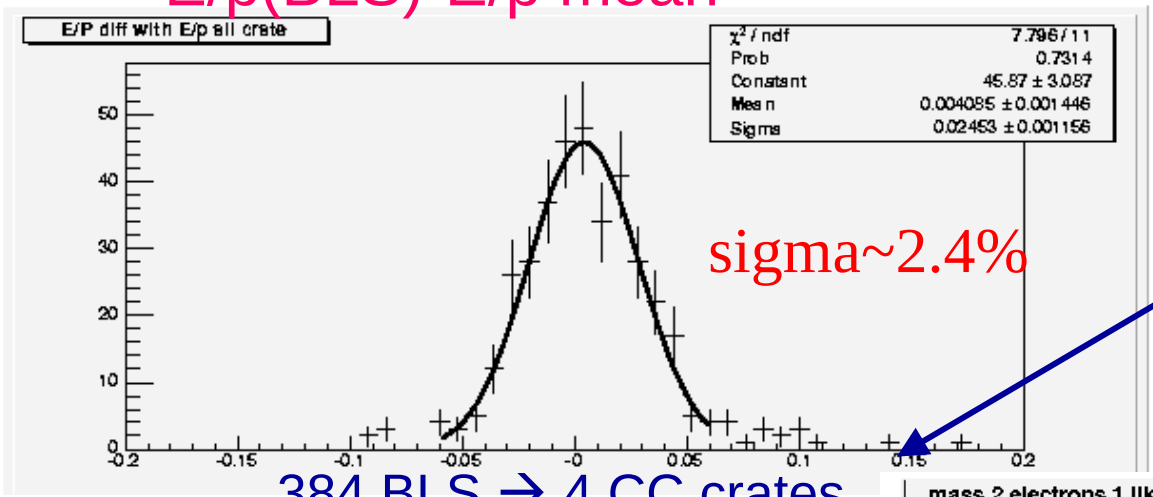


at the BLS level (4 towers) → tower level -> layer level

(use skimmed rootrees → get cells)

Preliminary

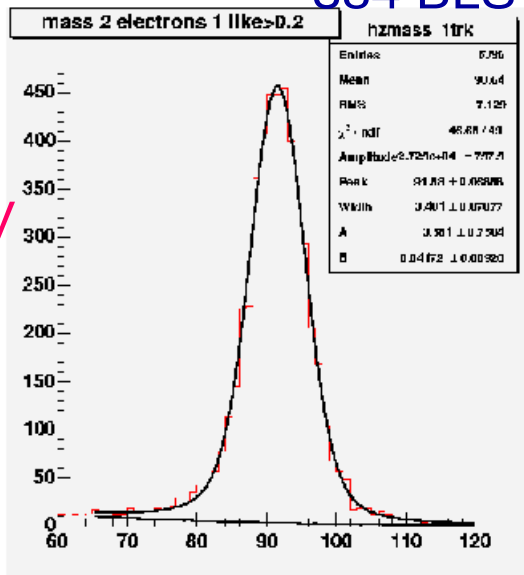
E/p(BLS)-E/p mean



bad BLS ?

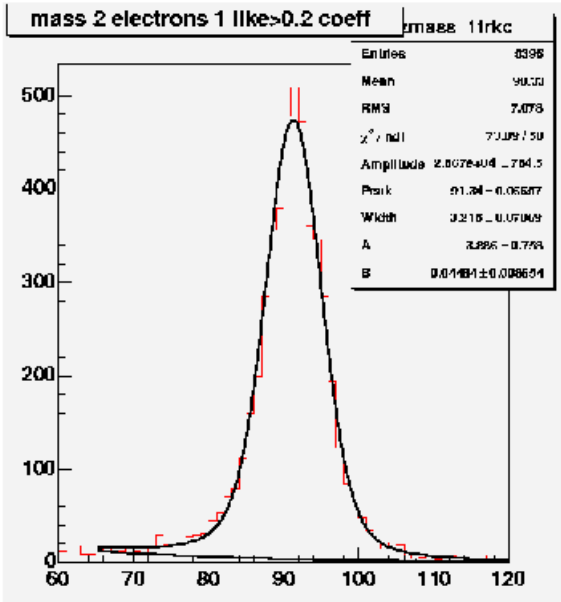
384 BLS → 4 CC crates

Z w=3.4 GeV uncorr



Z w =3.2 GeV corrected

better by 6%
→ resol on E improved by ~ sqrt(2)*6%= 8%

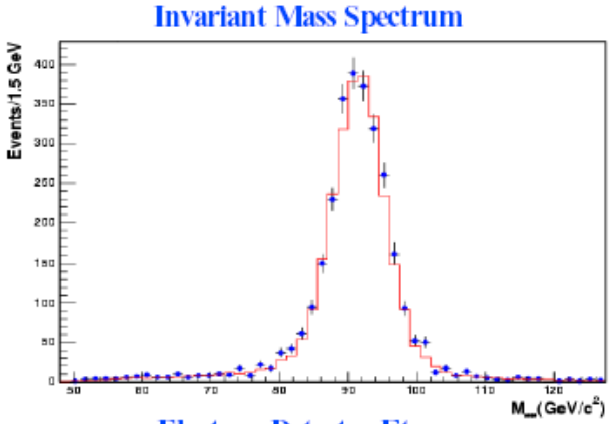


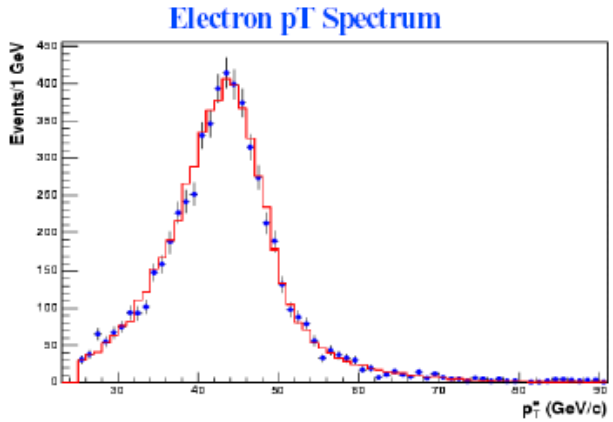
without latest gain/nlc calibration

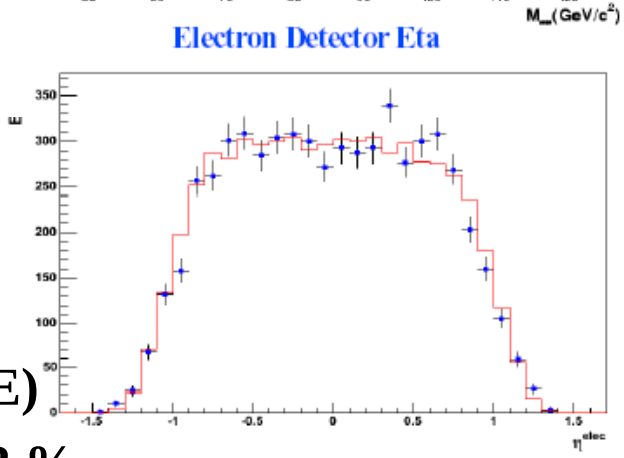
effort on phi-intercalibration started also on min-bias evts

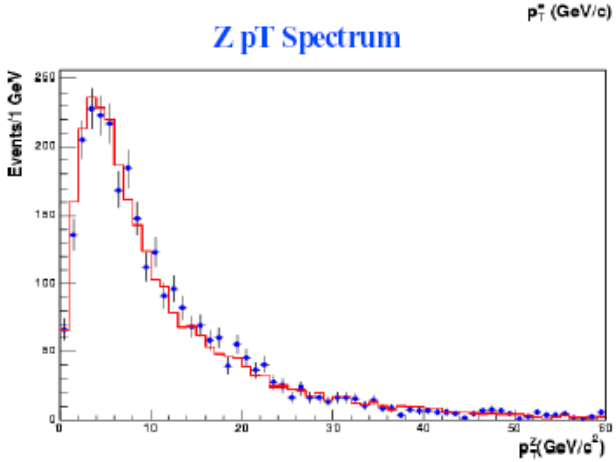
PMCS

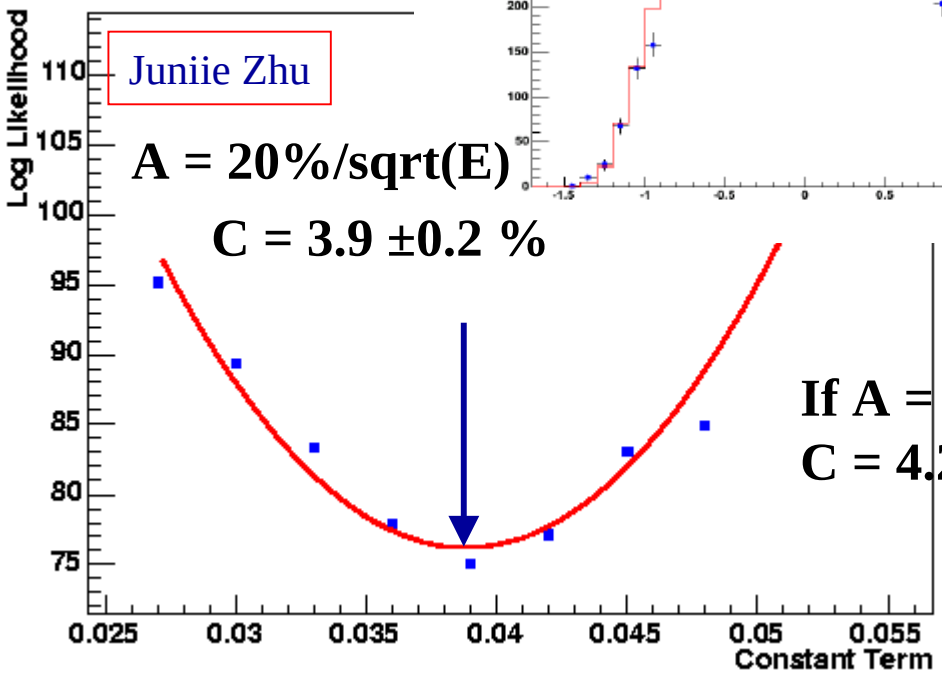
Values
1.0054 ± 0.0010
(0.038 ± 0.048) GeV
0.15 $\mathrm{GeV}^{1/2}$
$(4.20 \pm 0.23)\%$











Juniie Zhu

A = 20%/sqrt(E)

C = 3.9 ±0.2 %

If A = 15%/sqrt(E)

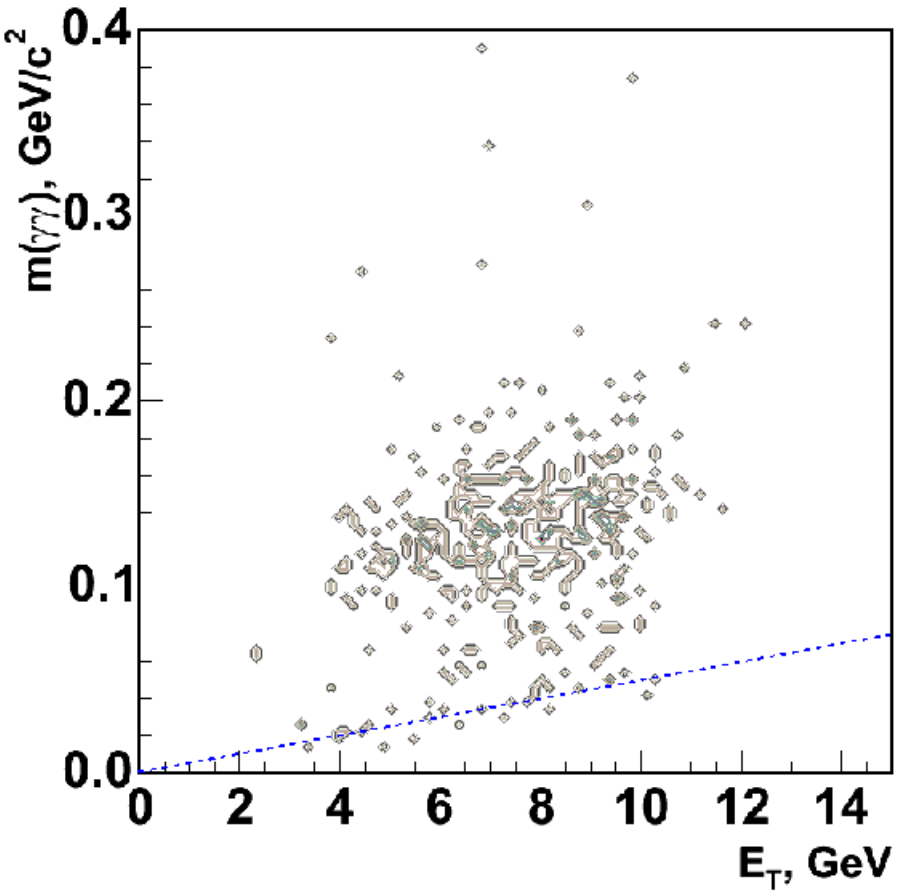
C = 4.2 ± 0.2 %

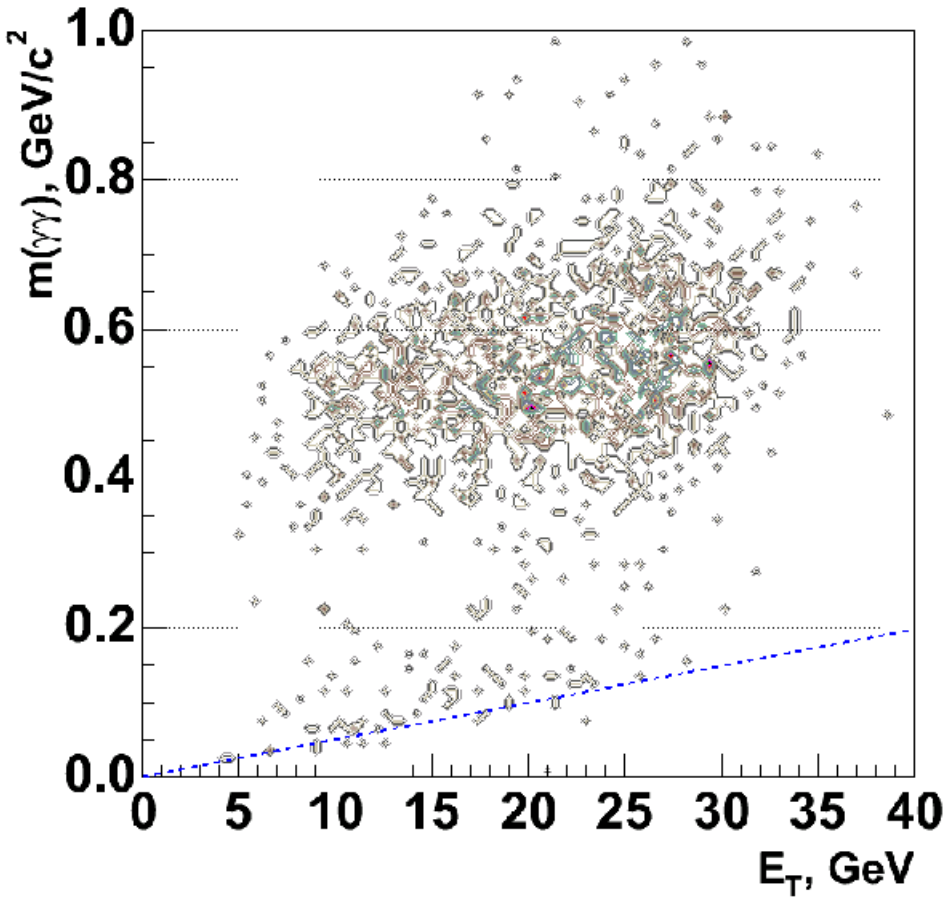
Likelihood on the Z mass with PMCS/data

Reconstruction of $\pi^0 \rightarrow \gamma\gamma$

- Require one good EM object (no HMx cut)
- Require at least two CPS clusters associated with EM
  - If more than two – use most energetic ones
- These CPS clusters must pass tight shower-like criteria
- Use CPS clusters' position with respect to primary vertex to reconstruct photons' trajectory. Assume energy of each photon a half of EM object's energy
  - One can also use CPS energy for weighting…

$\pi^0 \rightarrow \gamma\gamma$ and $\eta \rightarrow \gamma\gamma$ MC

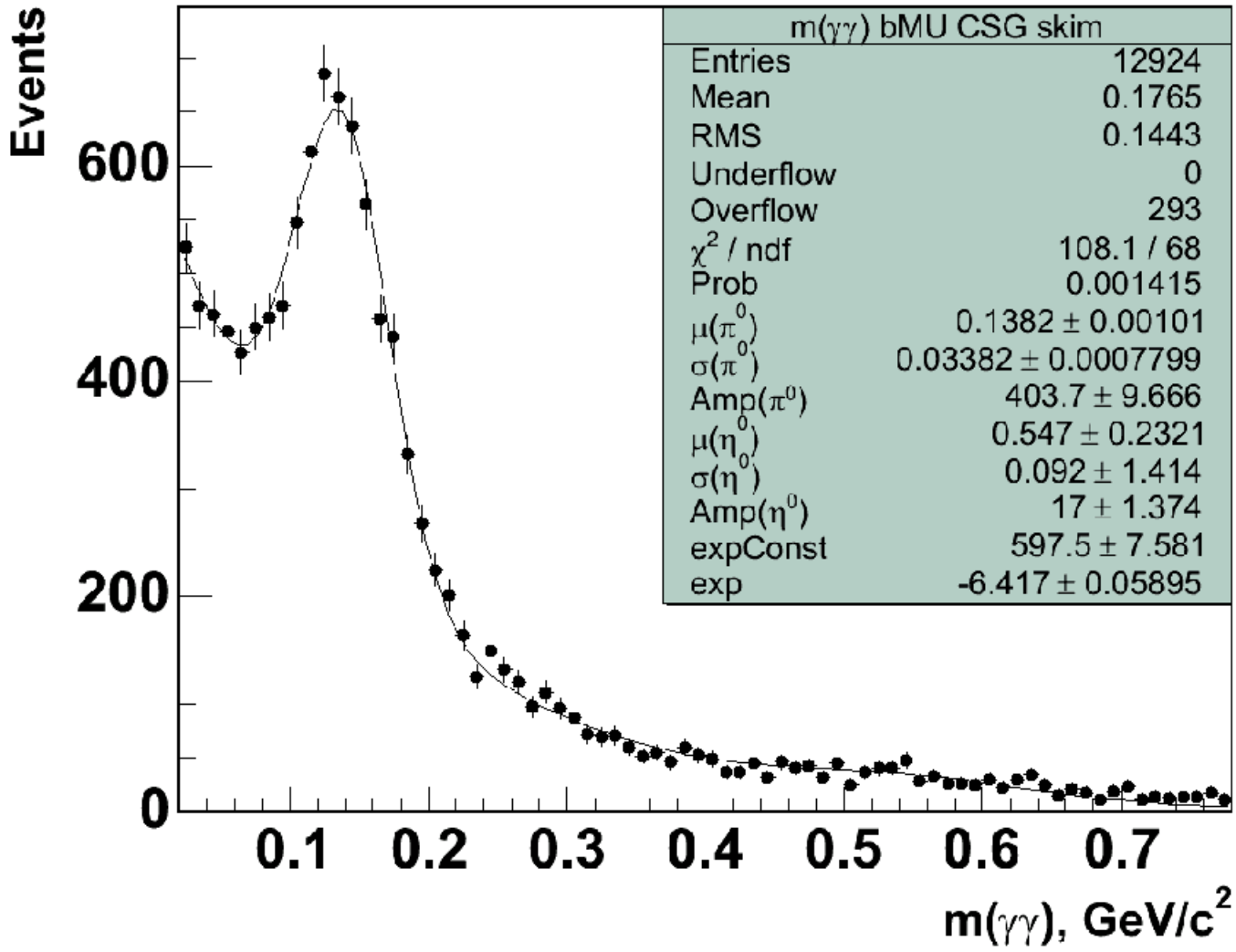




- **Lines indicate population of events where we reconstruct CPS clusters incorrectly**
  - **Most background comes from one high energy CPS cluster reconstructed as two clusters…**

Invariant mass fit (plus η)

Use bMU CSG sample where we require at least one muon-based trigger to fire ➔ cal-unbiased sample



Jet / MET / Energy Flow

Jet-Id (17:00->18:30)		**Chair:** Bob Kehoe/Slava Kulik **Room:** Hurricane Deck
17:00	jet ID, L1Cal remapping and L1Cal confirmation cuts (25') (transparencies)	Tobias Golling
17:30	Studies on Lowering jet_pt threshold (20') (transparencies)	Emmanuel Busato

MET and d0correct (10:45->12:00)		**Chair:** Sophie Trincaz/Patrice Verdier **Room:** Hurricane Deck
10:45	Lumi-block selection and status of met reconstruction (25') (transparencies)	Sophie Trincaz-Duvoid
11:10	Muons in calorimeter (20') (transparencies)	Nils Gollub
11:30	MET and event quality variable (15') (transparencies)	Kirti Ranjan
11:45	Missing ET in Z->ee sample (15') (transparencies)	Ashish Kumar

Energy Flow (13:00->14:15)		**Chair:** Anna Goussiou/Aril Schwartzman **Room:** Hurricane Deck
13:00	E/p studies (15') (transparencies)	Bernard Andrieu
13:15	CellNN studies (15') (transparencies)	Nikola
13:30	Track extrapolation (15') (transparencies)	Maren
13:45	HAD calibration (15') (transparencies)	Ariel
14:00	EM calibration (15') (transparencies)	Lydia/Jon

CalJetMet LBN selection for post-shutdown data

Summary

	With T42	Without T42
% of data kept	90.44%	89.20%
Estimation of data kept after p17 reprocessing	at least 95.53%	95.11%

T42 helps to clean helps to clean distributions but no effect on serious calorimeter problems

A large fraction of the rejected data were taken when there were « online » problems

Hot cells or pedestal shifts or toroid noise

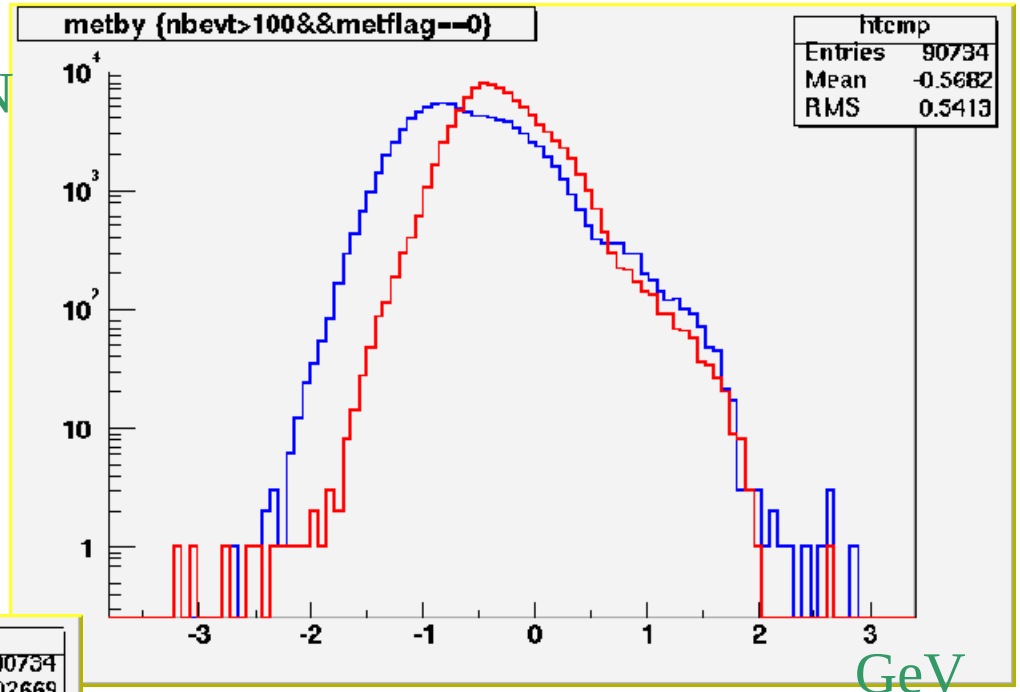
At the last meeting, fraction of data kept : 93% but hot cells problem in the ICD in very recent data (runs 192308 → 192365). Jets are good but MET is very bad.

dq_calo BAD runs are 1.6% of the data : we checked that ~30% of the runs flagged BAD by dq_calo are not flagged BAD by our selection

G. Bernardi
for CALGO

< METBx> and < METBy> after selection

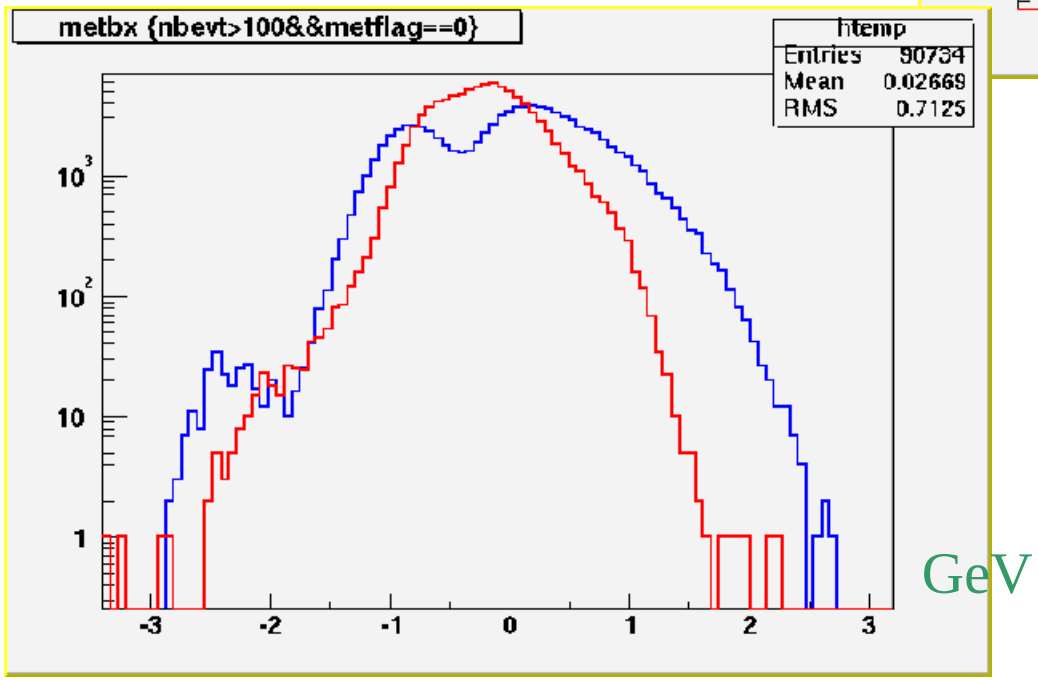
<METBy> per LBN



With T42

Without T42

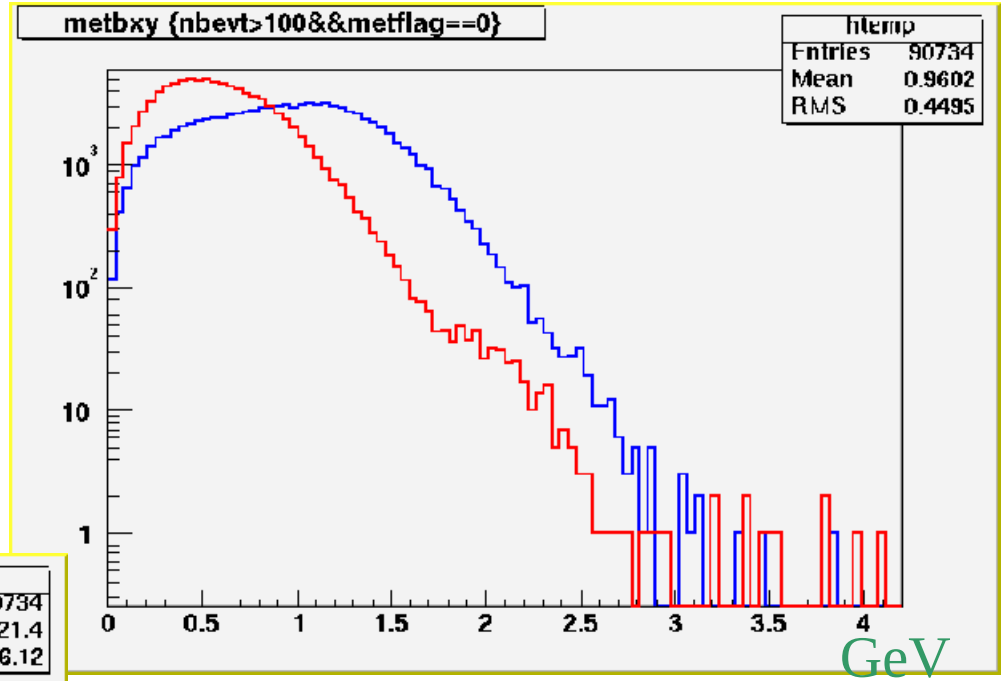
<METBx> per LBN



G. Bernardi
for CALGO

< METBxy> and < SETB> after selection

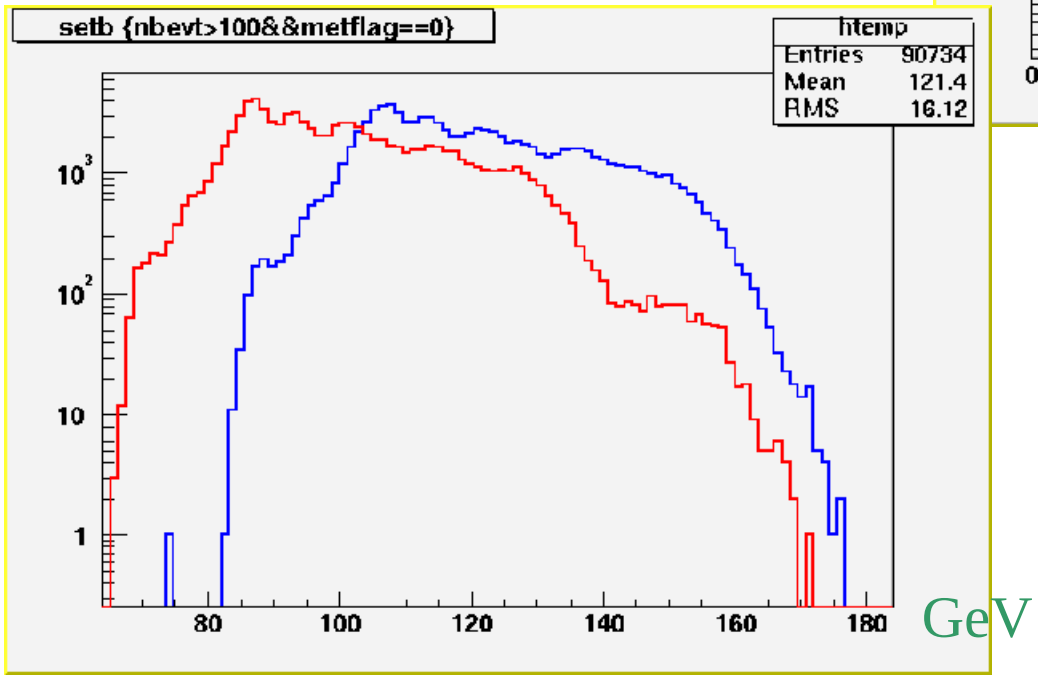
<METBxy> per LBN



With T42

Without T42

<SETB> per LBN



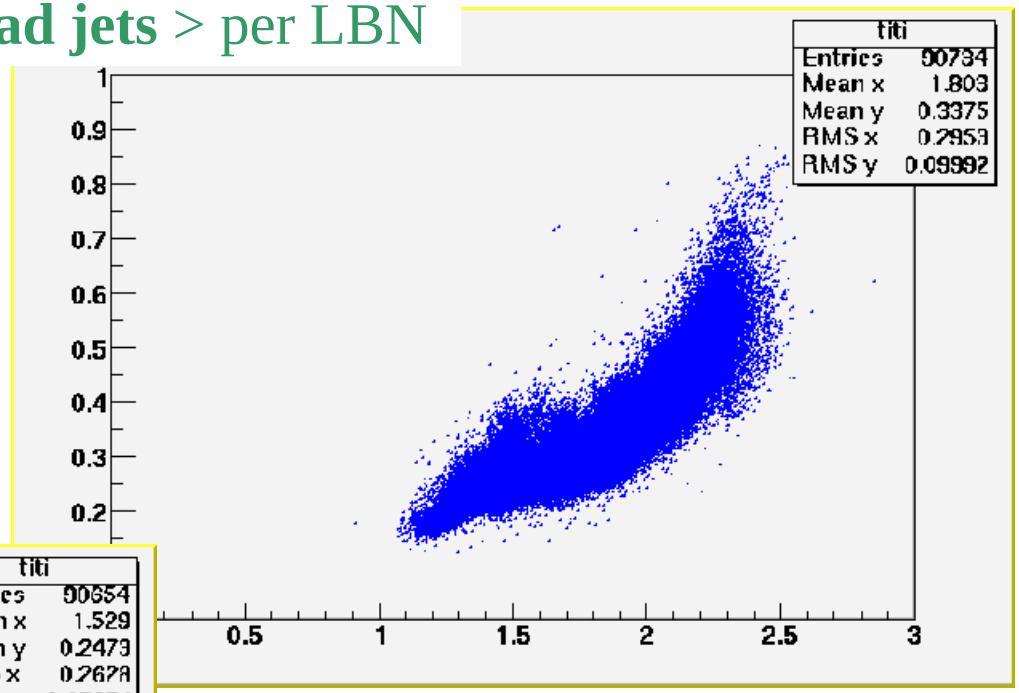
G. Bernardi
for CALGO

<# bad jets> vs <# good jets> after selection

Without T42

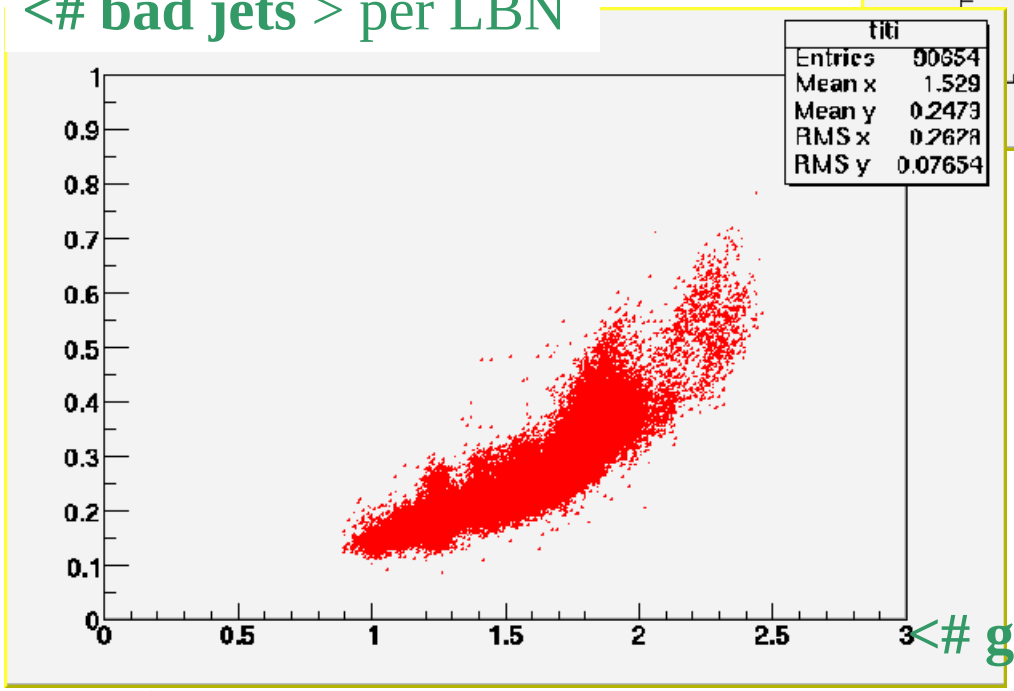
With T42

<# **bad jets** > per LBN



<# **good jets** > per LBN

<# **bad jets** > per LBN



<# **good jets** > per LBN

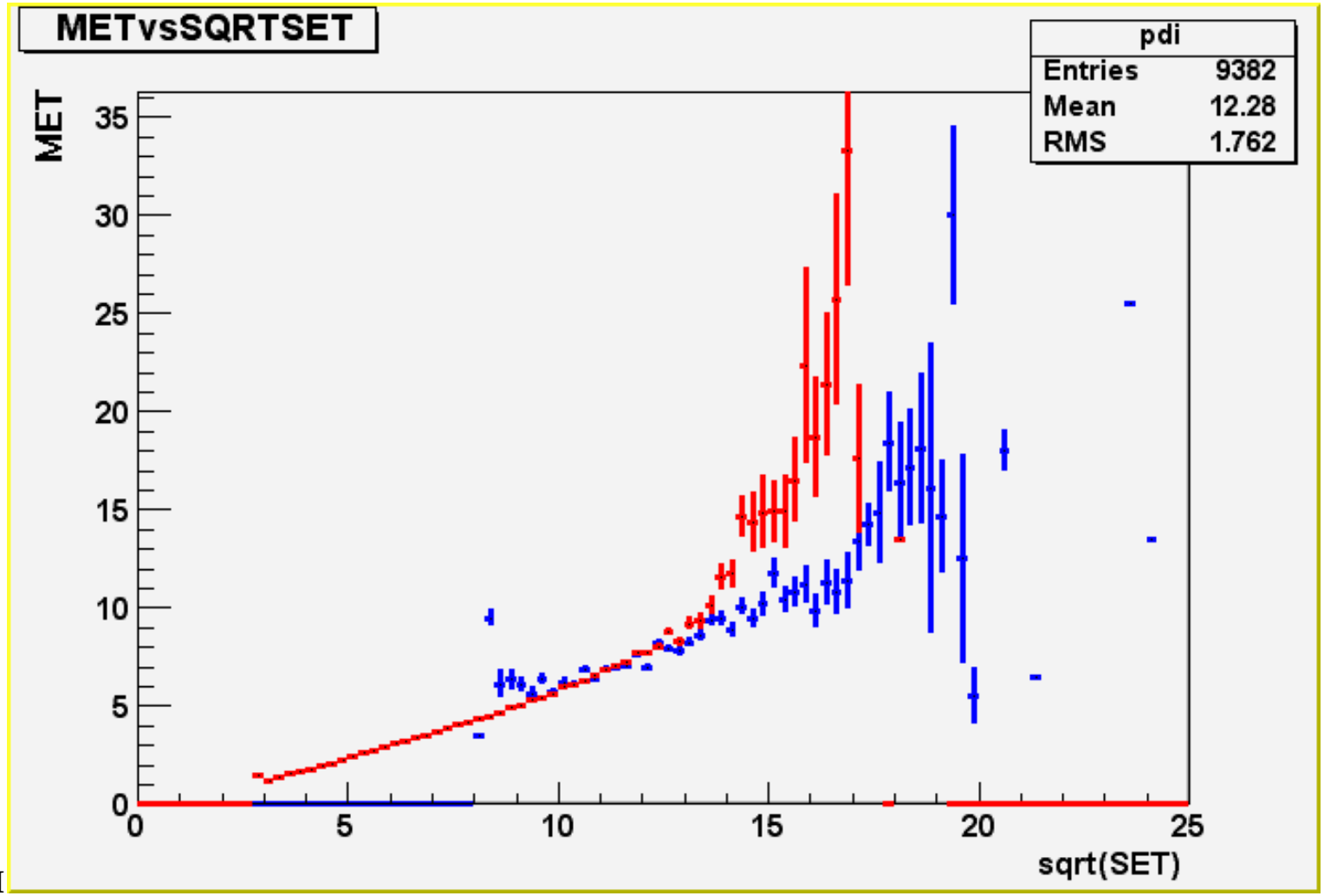
Proportion of bad jets is reduced after T42

G. Bernardi
for CALGO

MET vs √ SET

Min bias

Without T42 Di-jets back to back (3CJT5 monitor)



Slope is steeper than in run I

G. Bernardi
for CALGO

Negative mass towers in jets

Run II jet algorithm inherited from the Run I algorithm a cut rejecting negative mass towers.

2 things can produce negative mass towers :

- negative energy cells (cf http://www-d0.fnal.gov/~busato/negativ_mass_towers.pdf)
- finite precision (rounding problem)

› Laurent and Nikola found that this cut has sometimes an unexpected behaviour on data reconstructed without t42. They ran over jet triggered data and found that :

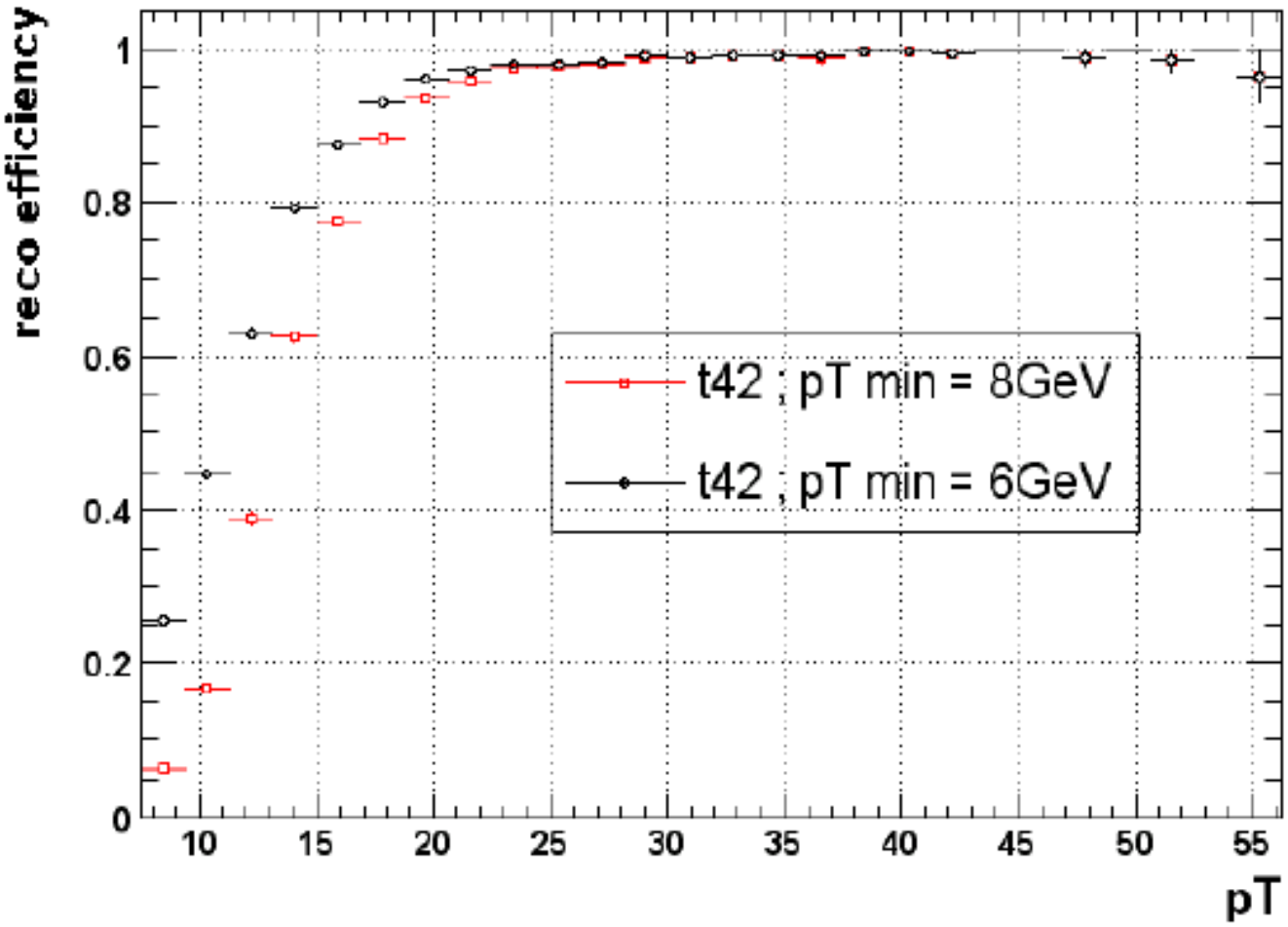
- 11 % of events have a 1 GeV tower killed
- 1.5 % of events have a 5 GeV tower killed

Laurent studied the effect on the jet resolution but didn't find any !

› I then ran over 1000 events of a TMB file with t42 and found that 0 towers are rejected

Conclusion : there if an effect on data produced without t42, not on data produced with.

Jet reconstruction efficiency in QCD MC

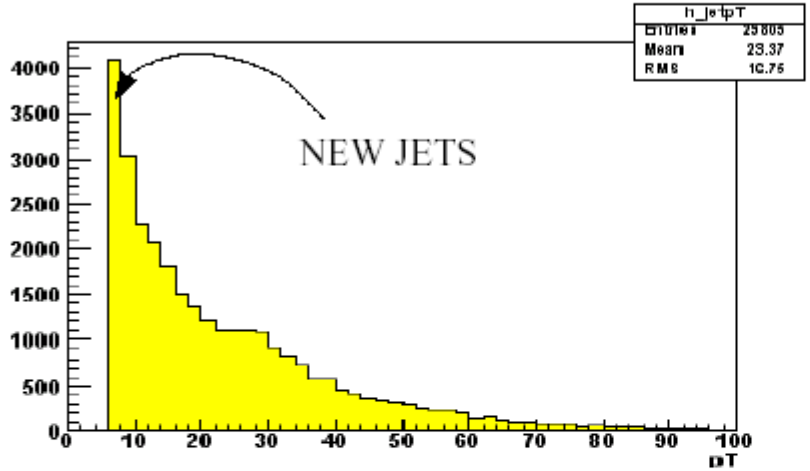


reconstruction efficiency at low pT is much better with a cut at 6 GeV

Low E_T Jets

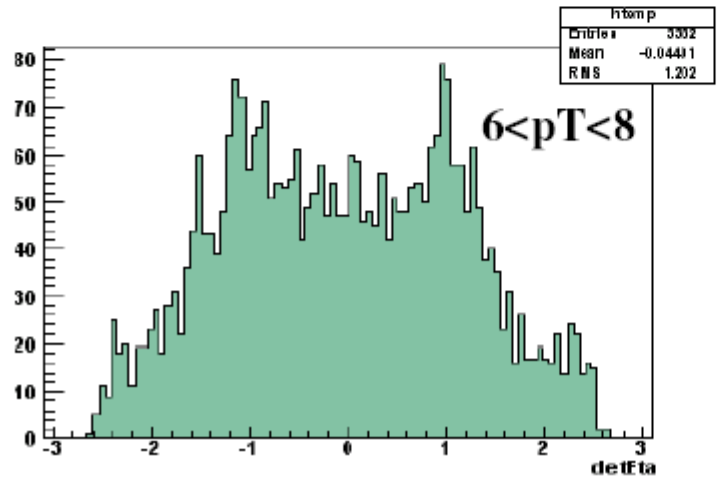
How do new jets look like in data ?

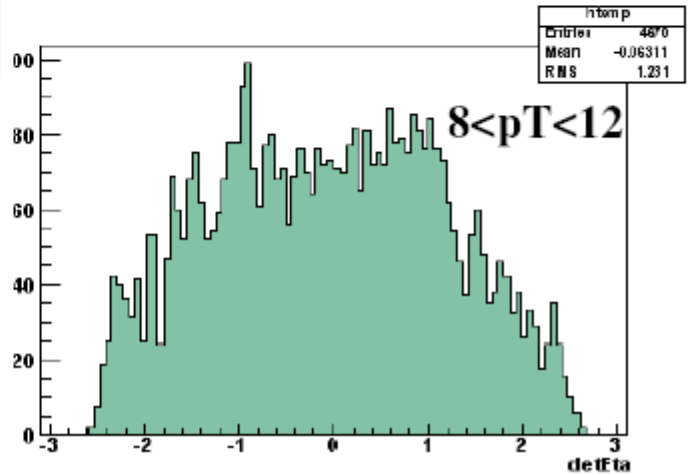
Data sample : TMB file -> recoT_all_0000167663_mrg_001-030.raw_p14.03.02



All the jets are 11 confirmed,
no other cuts applied

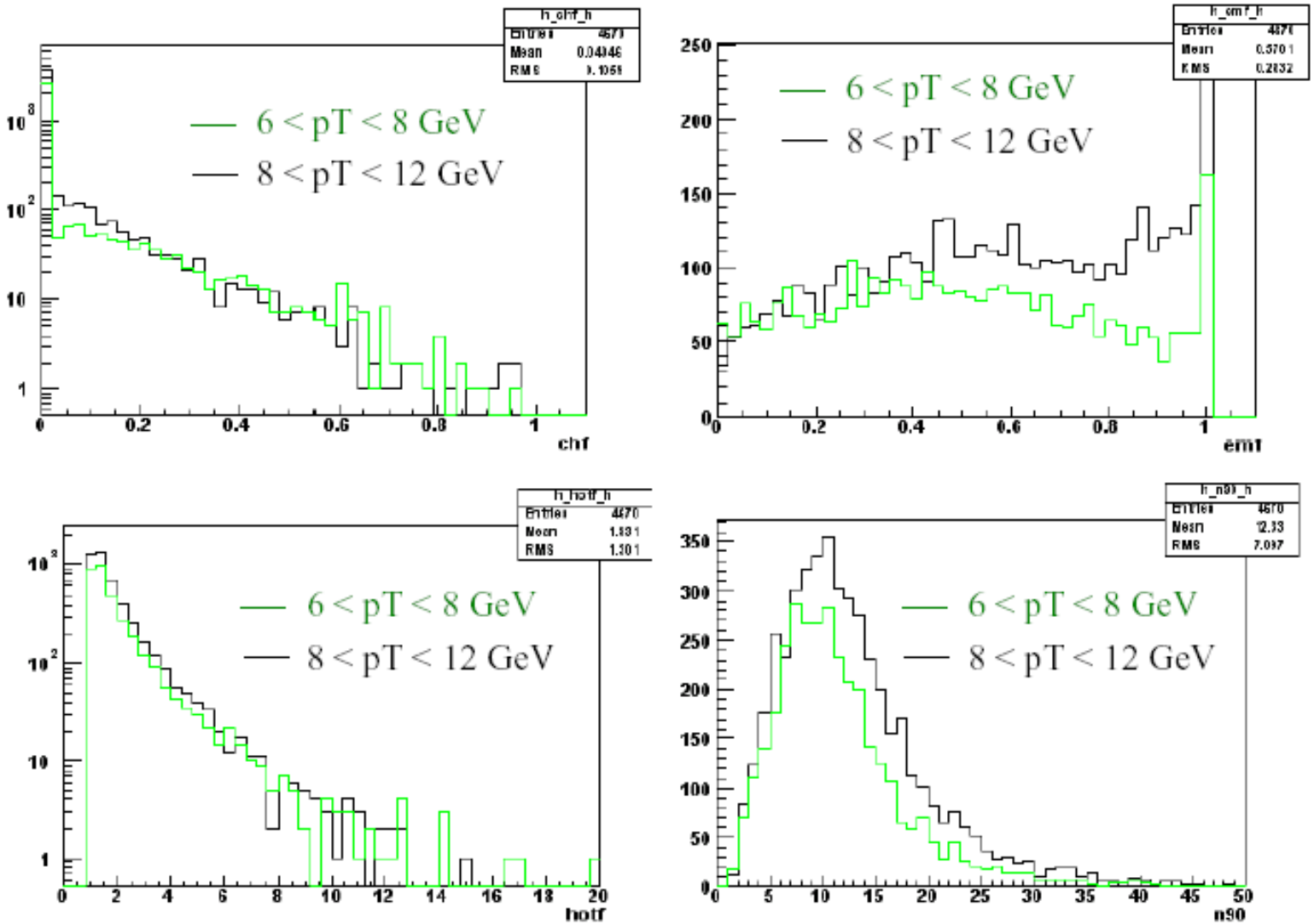
Jet multiplicity increases by ~ 13 %





Low E_T Jets properties

ID variables



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Conclusion

- Jet multiplicity increases by 10 – 15 %
- Jets below 8 GeV are more sensitive to fluctuations in the ICR, but still most of them seem to good.
- ID distributions for the new jets look good.

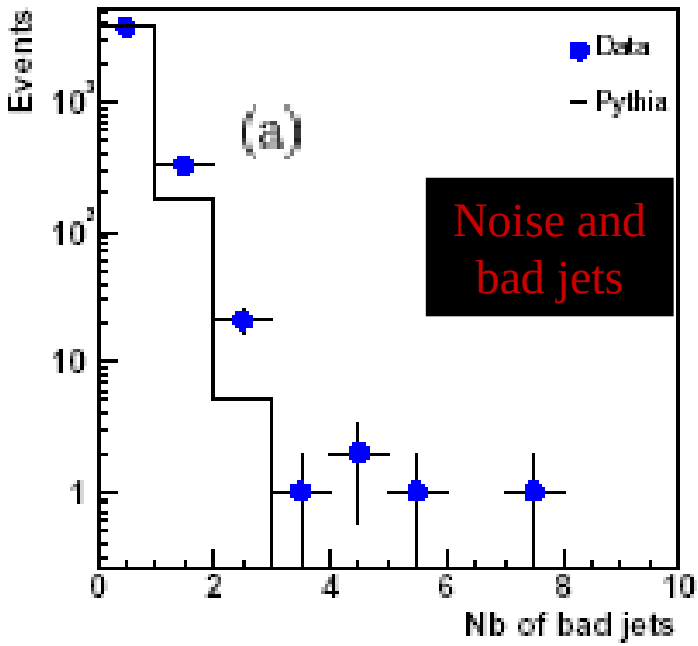
The use of jets between 6 and 8 GeV (before JES) is important for those who want to consider jets below 15 GeV (after JES) in their physics analysis.

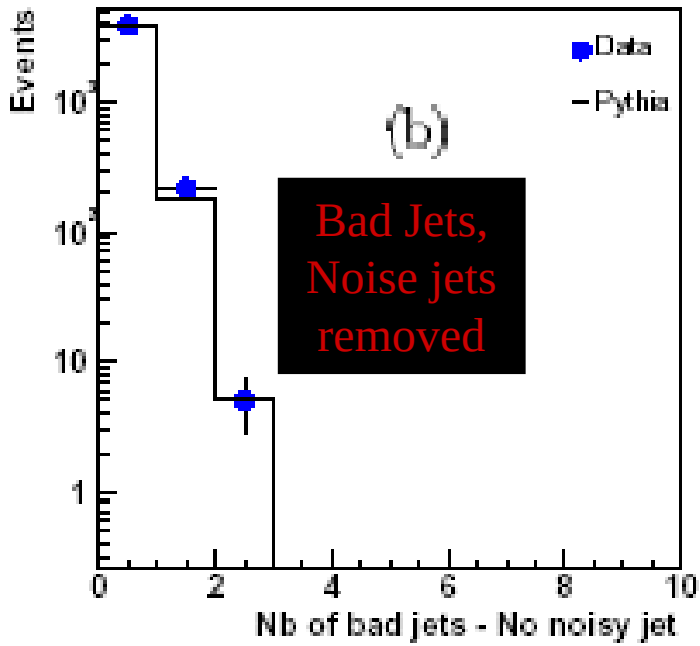
If for some reason one realizes that these jets are not usefull, it is very easy to go back to the current situation (< p17) by applying the 8 GeV cut at a later stage of the analysis.

Jet definition (top)

- **Good jet = L1 confirmation + Quality cuts**
  - **0.5 < EMF < 0.95**
  - **CHF < 0.4**
  - **HotF < 10**
  - **N90 < 2**

- **Bad jet = Jet failing one the quality criteria** ⇒ **Reproduced by Pythia**
- **Noise jet = no L1 trigger confirmation** ⇒ **Not in MC**





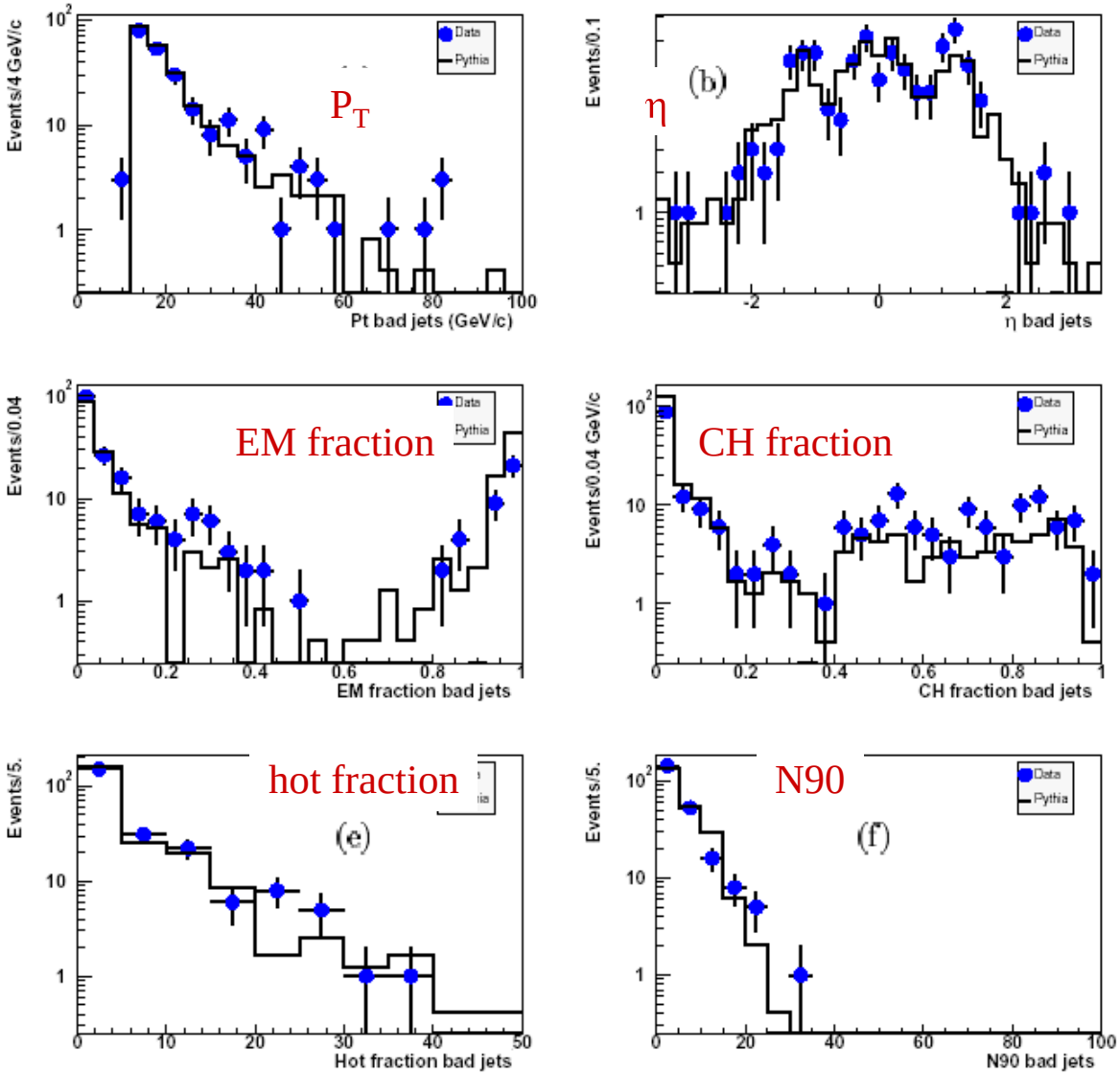
Note: Jets energy are smeared in top analyses

On going work

- **Search for an *Event Quality Variable* to reject Noisy* events**
  - **Basis**
  - **Comparison of the occupancy of TT for different Jet Multiplicity**
  - **Event Quality Variable…provisional proposal**

Noisy* : Precision TT see comparatively higher energy than L1 TT through-out…explained later.

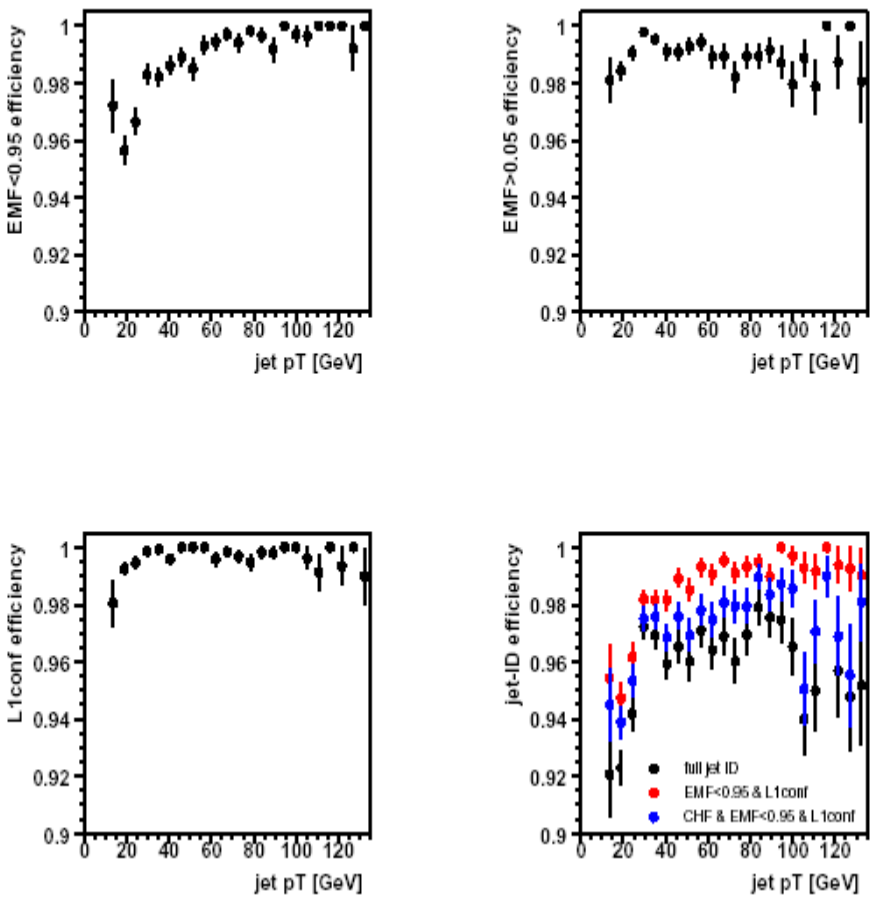
“Bad” jet study using L1 conf



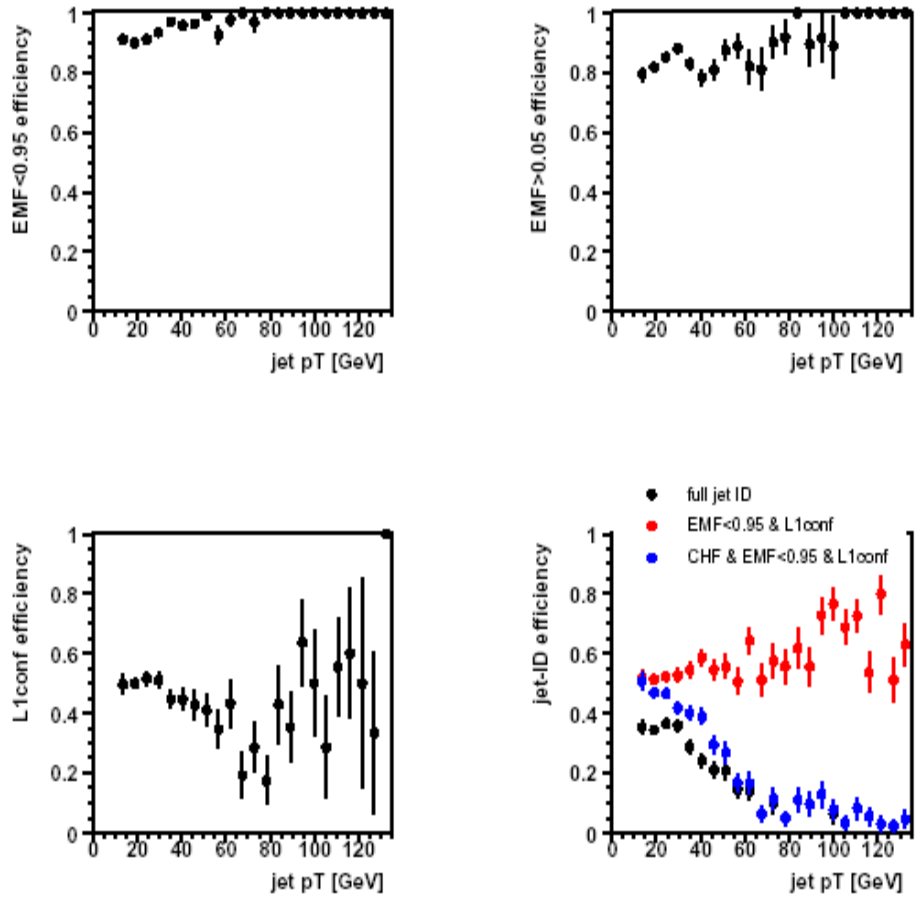
Bad jets with L1 confirmation are “physics” jets very well described by Pythia

Jet ID for p14

Good Jets



Noise Jets



Blue: new id proposed jet-id cuts:

w/o n90, Hotf, EMF < 0.05, vs OLD

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Conclusions

- Things are moving on many fronts:

  Monitoring, Infrastructure, Calibration, Algorithms

  Data Quality is reaching a satisfactory status

  Still struggling with resolution/calibration, but maybe

  We are paying the fact that the calorimeter is measuring only 2/3 of the signal (-> more fluctuations?, no compensation anymore) but we are learning (as a collaboration) to cope with it:

  ➔Need better EM shower understanding

  ➔Need to better take into account EM-Had scale difference

  Fix02 is providing us already improved data (T42.5, HC) killing checkerboard fix and more info on tmb

  P17 ➔ Full use of DB, T42.0, CCMG correction

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