



Jet corrections meeting

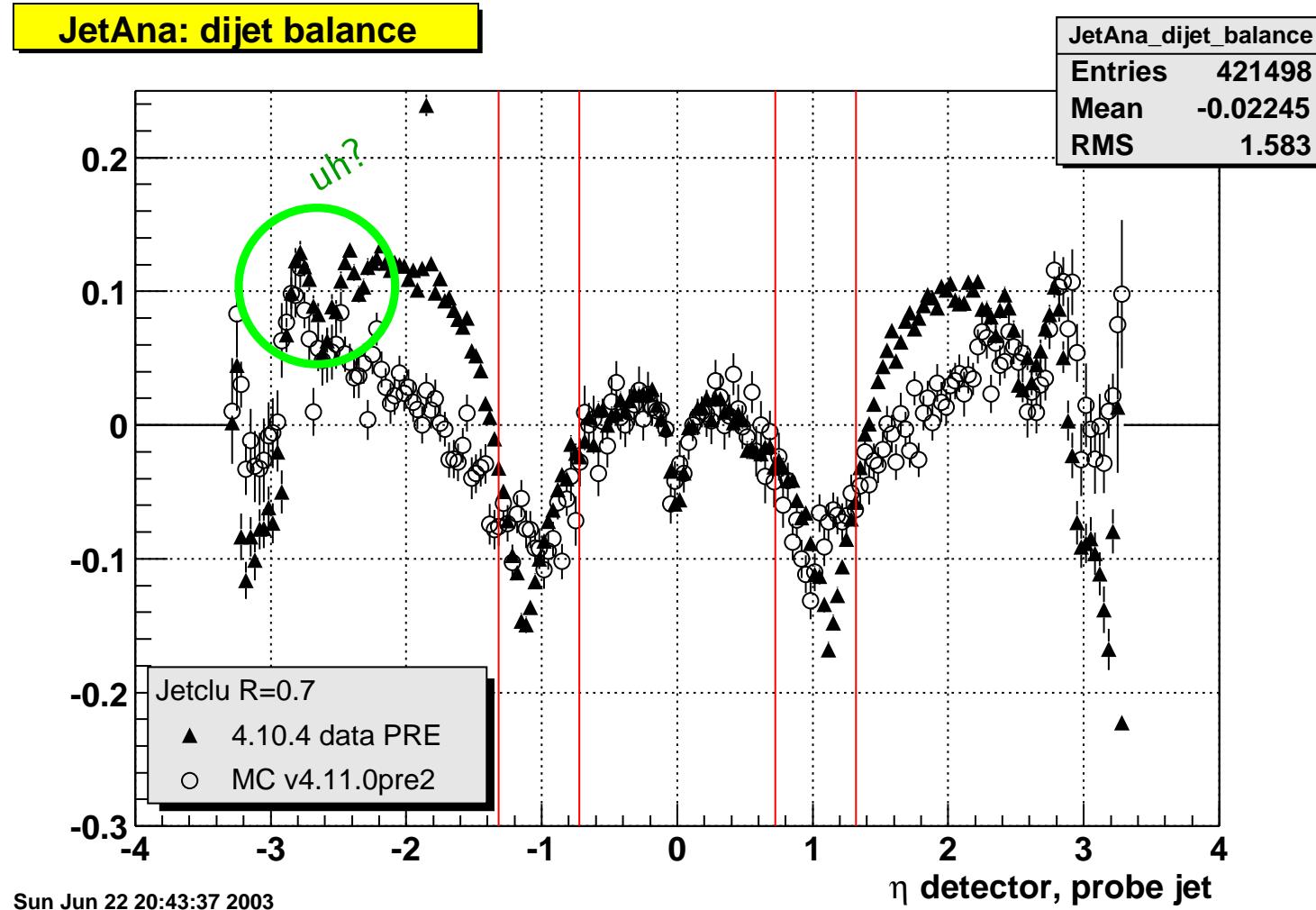
www-cdf.lbl.gov/~currat/talks/

Charles Currat
LBNL

July 9, 2003

- ❖ Summary of Lake Geneva talk (1^{st} top mass workshop)
- ❖ Games with Gflash and GEANT

Closeup view with 240 bins



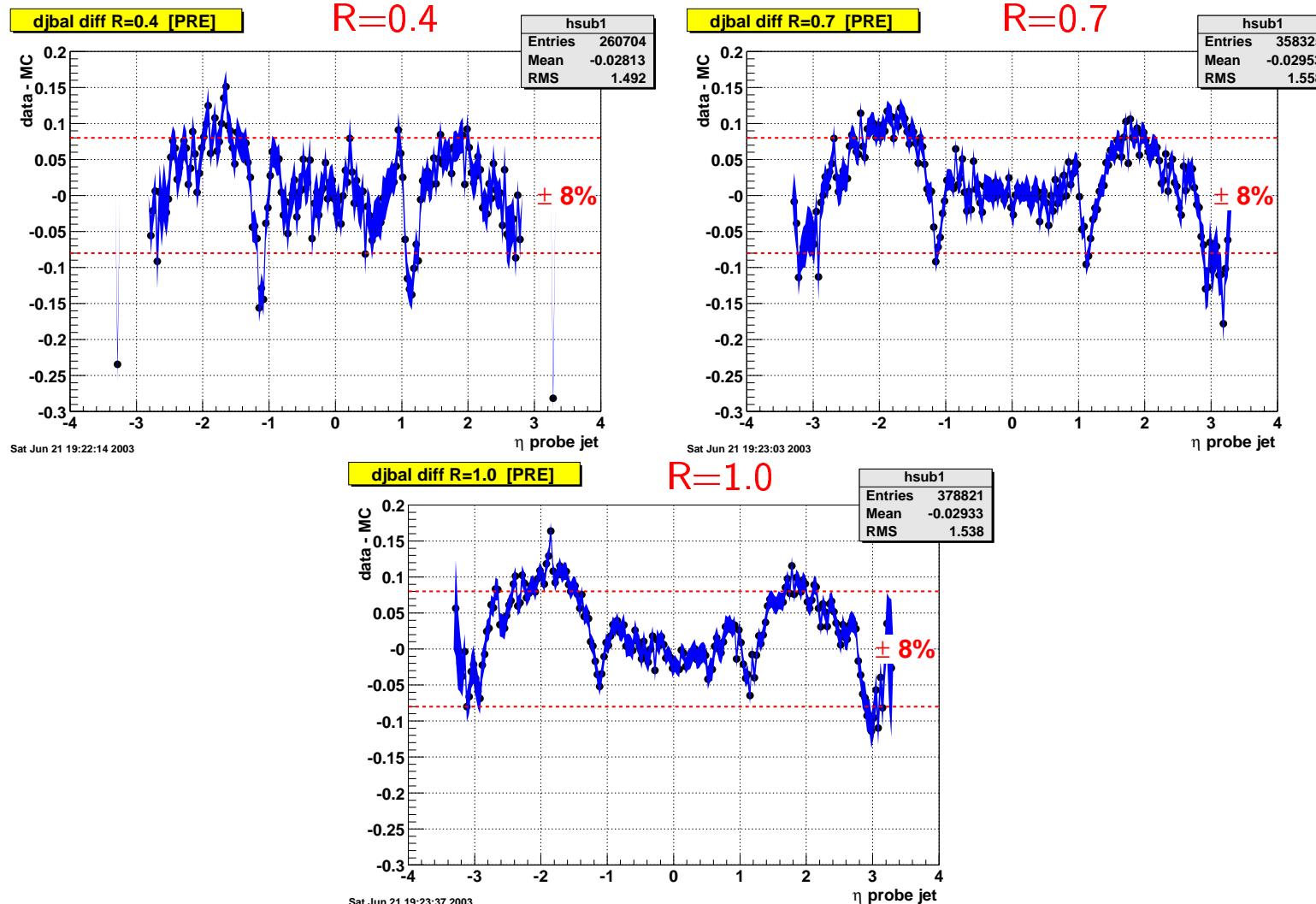
☞ artefact of JetClu due to the fact that towers are getting bigger?



Data/MC comparison



Dijet balance difference plots (data v. 4.10.4 - MC v. 4.11.0pre2)



👉 Central within $\pm 2\%$



Modifs since 4.9.1



Modifications in the calos simulation between 4.9.1 and 4.11.0pre2

- ❖ geometry fixes in coil geometry + WHA position (CC)
- ❖ passive material at the COT face plate (Elena, Manfred)
- ❖ adjusting T14,15 [11, 10]_{TDR} to pick right parameterization (S. Jun)
- ❖ muons tuning in WHA (S. Jun)... but not implemented yet
- ☞ necessary changes but with no big impact

In passing, sampling structure in WHA \neq CHA by construction (cf CDF BlueBook):
absorber/active \rightarrow 2in/10mm (WHA), 1in/10mm (CHA) \Rightarrow low E_s ?

- ☞ as now all of the shower parameters in Gflash are the same for CHA and WHA...

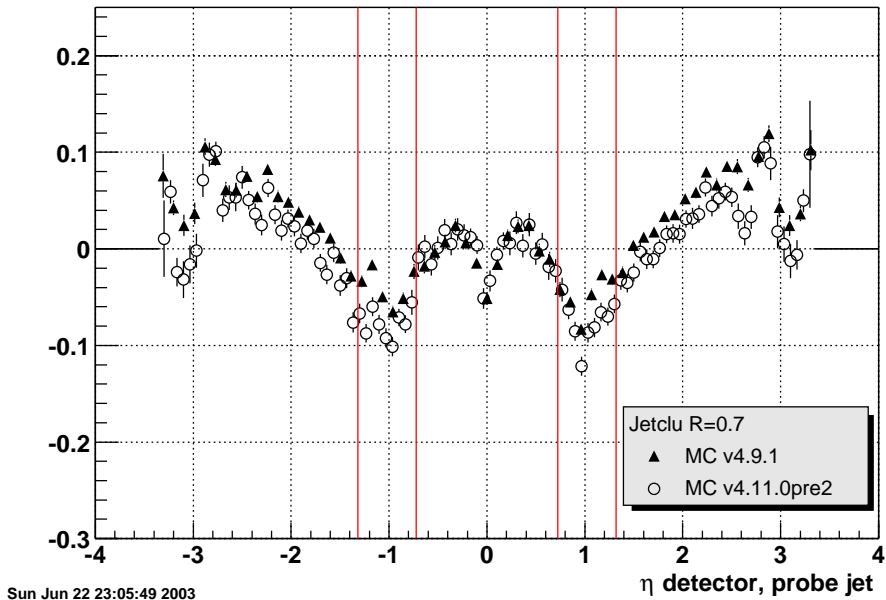


Comparison MC/MC



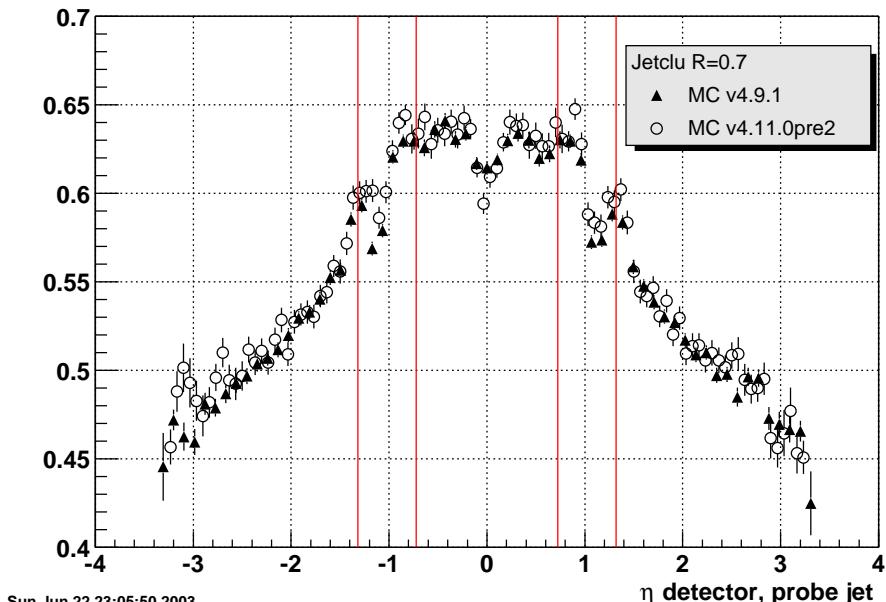
Dijet balance and jet EM fraction between 4.9.1 and 4.11.0pre2

JetAna: dijet balance



Sun Jun 22 23:05:49 2003

JetAna: jet EM fraction



Sun Jun 22 23:05:50 2003



What can be wrong? List of plausible reasons, we checked (are still checking) on...

- ❖ Geometry (dims/position) in GEANT \Rightarrow small modifs needed but no major effect
- ❖ Passive material in GEANT as of v 4.11.0pre2 \Rightarrow not a major effect
- ❖ Cracks in the plugs \Rightarrow no effect... too small (see Jet Correction meeting 5/28/03)
- ❖ Implementation of the various tower "types" (5 different types in $0.9 < |\eta| < 1.4\dots$) \Rightarrow no (at least flagrant) bug
- ❖ Modeling of the underlying event? \Rightarrow I doubt according to what single particle scans look like
- ❖ Non-linearity in the plug \Rightarrow very plausible, working on it... but tune it referring to what? Mimic central (cf CDF#5874)
- ❖ My prejudice too: limitation in Gflash... array dimension, MIN/MAX(constant,f(E)) functions all over the place... (something similar already happened at the time)



Plug tower response to single π 1/2



Shooting 57 GeV π in the center of each plug tower (B field turned off). Energies in [GeV]. **Gflash parameterization**. Gaussian (single) fit on peaks. No AI plate makeshift for COT front plate here (tuned after test beam config).

plug

WHA

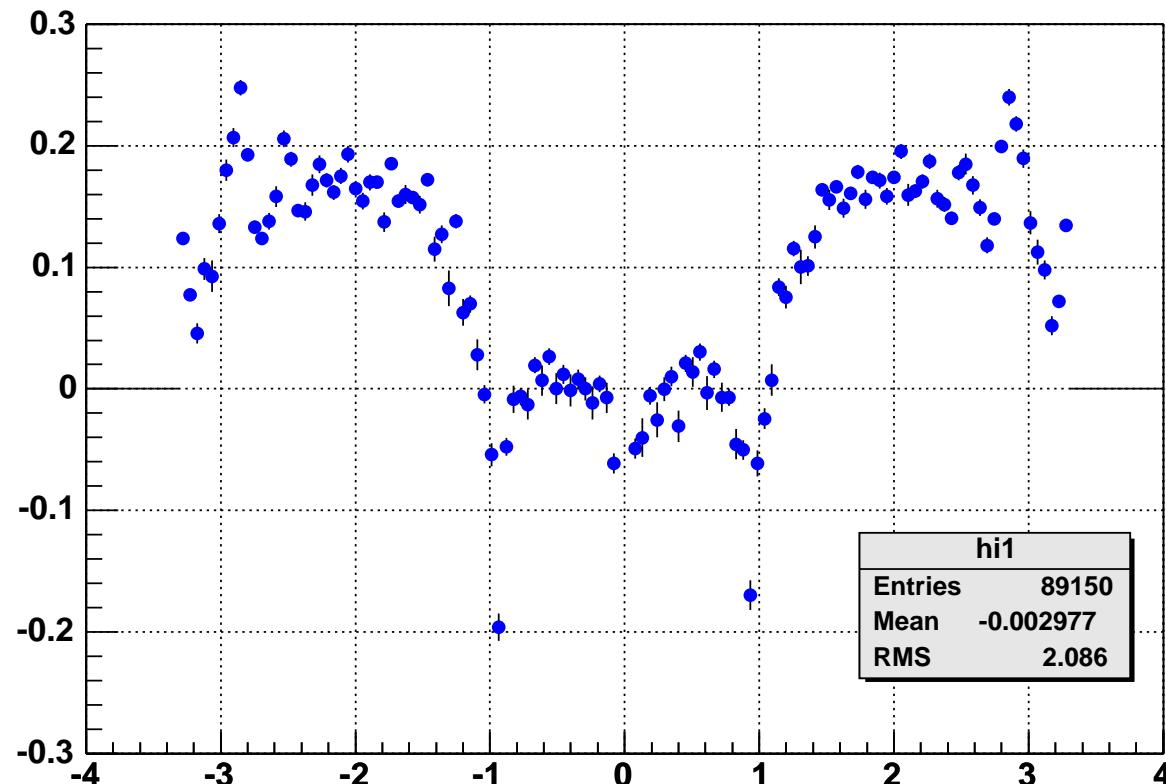
ieta	mip [GeV]	EM_mip pk	σ_{EM_mip}	Full_E pk	E/p
plug	4	0.35	54.9	6.6	51.2
	5	0.36	57.8	6.1	54.3
	6	0.36	58.1	6.1	53.5
	7	0.38	57.9	6.3	54.7
	8	0.38	58.2	5.6	54.1
	9	0.37	58.3	6.1	54.1
	10	0.38	58.2	6.3	54.1
	11	0.38	58.4	5.5	54.1
	12	0.39	58.3	6.2	54.3
	13	0.40	58.6	5.8	53.8
WHA	14	0.41	61.1	7.8	56.1
	15	0.28	56.2	6.1	53.6
	16	0.25	57.1	5.8	51.9
	17	0.35	53.7	6.4	44.9
					0.80



No major problem!

Plot of single $p_T = 20$ GeV/c pion balance scan. Assume perfectly balancing (virtual) particle/jet in the central.

Fake_balance [R=0.7]



Mon Jun 23 22:31:18 2003

- 👉 No major problem!
 - ❖ sharp dip in the WHA cracks
 - ❖ nice plateau in the plugs



Non-linearity in the plug 1/2

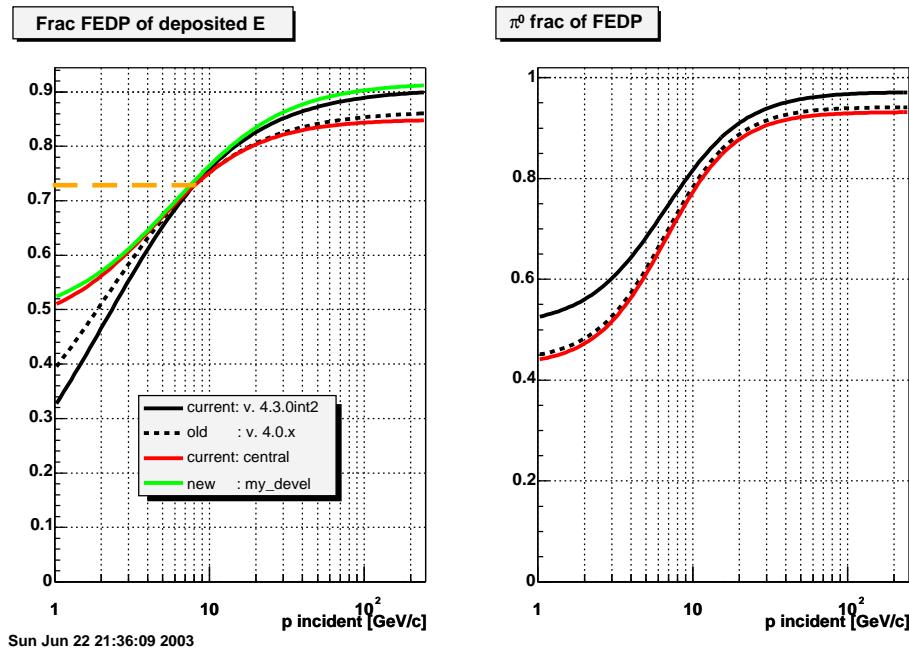


Shooting low E π in the center of plug tower W1T8 (ieta=11, B field turned off). Energies in [GeV]. **Gflash parameterization**. Gaussian (single) fit on peaks.

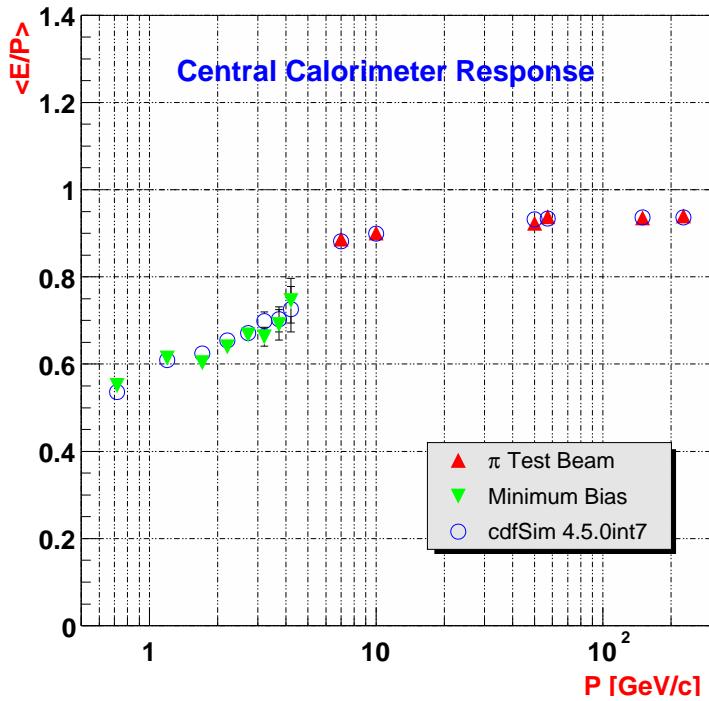
E_π	$(E_{T\pi})$	mip [GeV]	EM_mip pk	Full_E pk	E/p
untuned	3 (1.2)	0.35	0.74	0.95	0.32
	5 (2.0)	0.37	3.00	2.7	0.52
	7 (2.8)	0.36	6.52	5.2	0.73
	10 (3.9)	0.37	10.1	8.3	0.83
	20 (7.9)	0.37	20.4	17.9	0.87
	30 (11.8)	0.37	30.6	27.6	0.92
	57 (22.5)	0.38	58.4	54.1	0.95

👉 Something to be done (well, was expected...)

Reminder: Gflash tuning in CDF#5886. Plug tuned down to $E=8$ GeV in W1T8, $E_T = \sin(\theta(\eta = 1.58)) \times E = 3.2$ GeV. Below that, *terra incognita...* and so probably not adequate



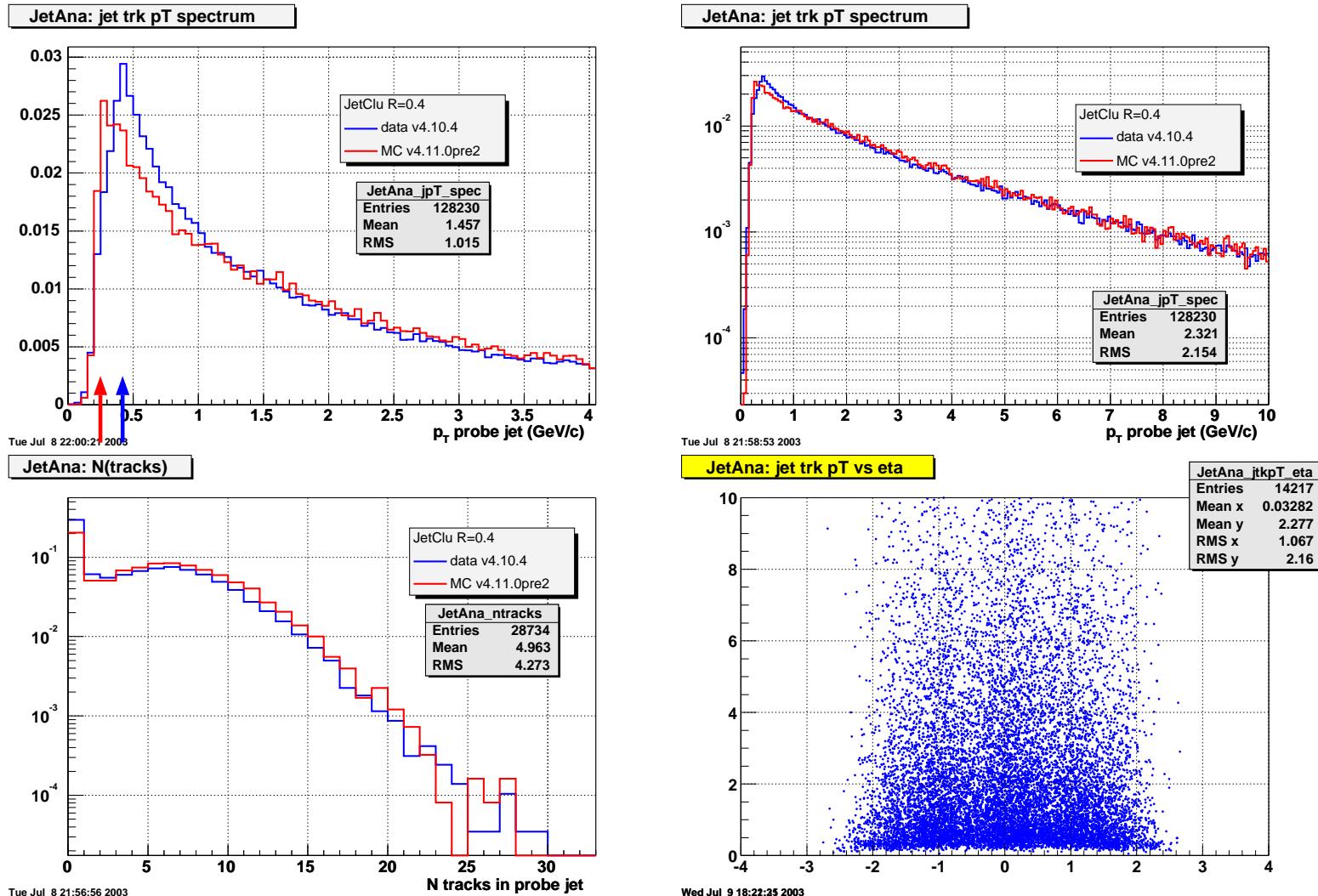
Sun Jun 22 21:36:09 2003



Soon J.,
Sarah D.
(single
tracks)

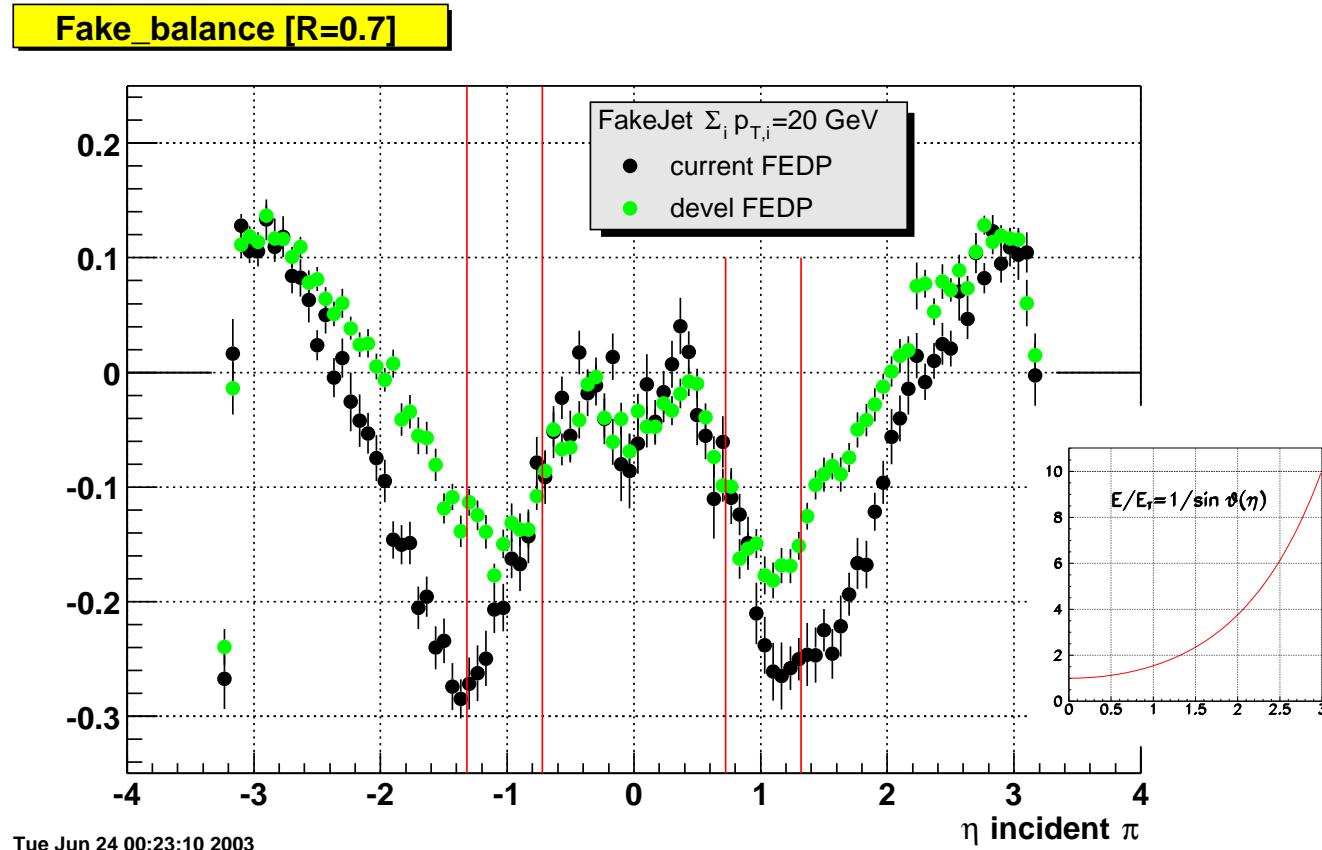


Jets anatomy 101



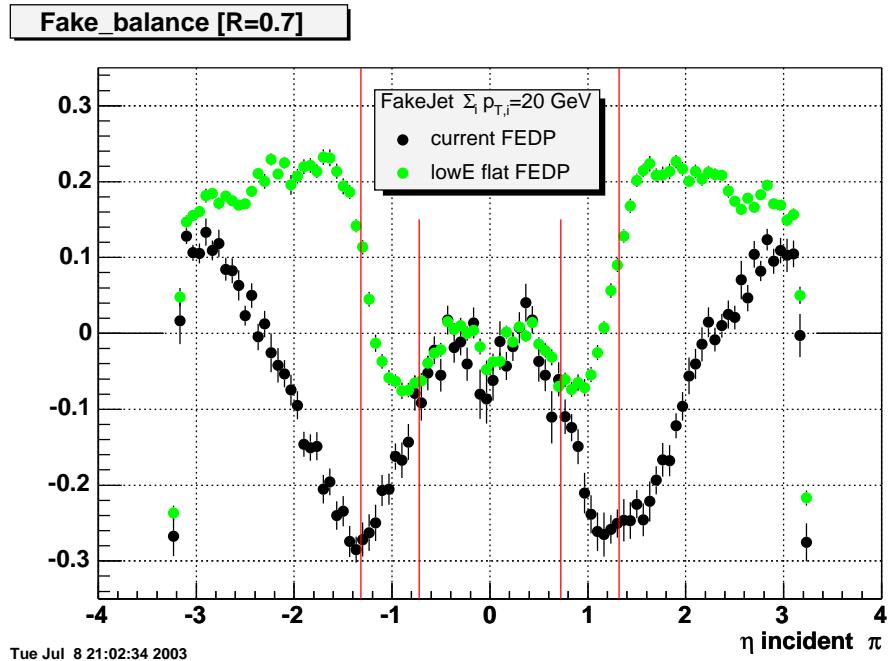
👉 Proper low- E Gflash parameterization in the plugs is definitely required!

Check out green curve versus black curve... Home made fake jets based on FakeEvent, 20 particles with $p_T = 1$ GeV/c each with gaussian distribution with $\sigma_R = 0.22$ ($\frac{2}{3}\pi^\pm, \frac{1}{3}\gamma$ abundance)

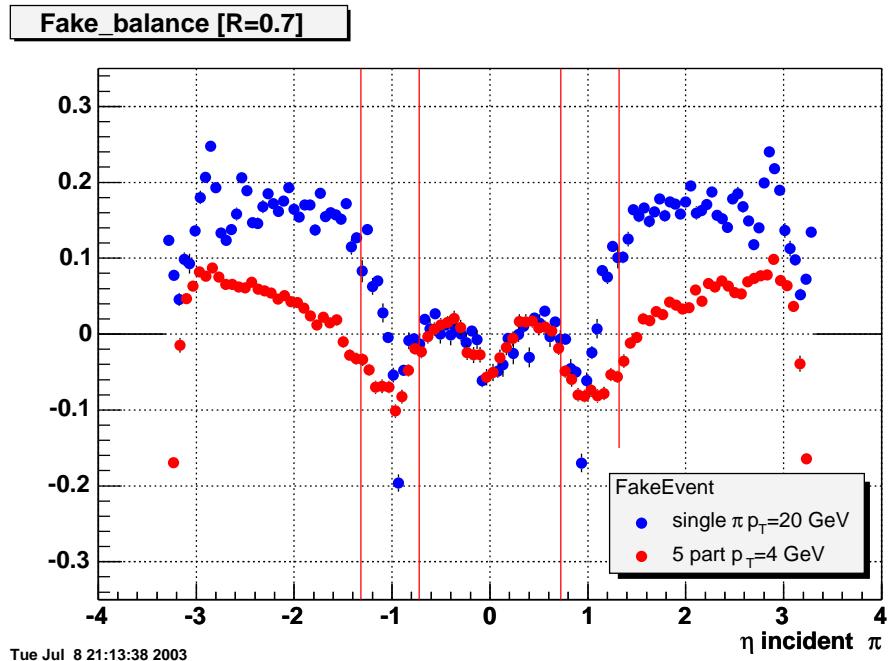


☞ The problem persists! still no plateau... however points out there's yet another thing to take care of!

Fake jet of 20 particles with $p_T = 1 \text{ GeV}/c$ in current Gflash parameterization compared with FEDP=Cte for $p_{inc} < 8 \text{ GeV}$



Single pion with $p_T = 20 \text{ GeV}/c$ compared to 5 particles (fake jet) with $p_T = 4 \text{ GeV}/c$ each





Plug tower response in GEANT



Shooting 57 GeV π in the center of each plug tower (B field turned off). Energies in [GeV]. **GEANT detailed simulation**. Gaussian (single) fit on peaks. To be compared to table p.12 in my Lake Geneva talk

ieta	mip [GeV]	EM_mip pk	$\sigma_{EM\text{-}mip}$	Full_E pk	E/p
plug	4	0.37	36.3	5.2	35.1
	5	0.37	36.6	5.2	35.5
	6	0.37	36.8	5.0	35.5
	7	0.36	36.8	5.1	35.9
	8	0.37	37.1	5.0	35.6
	9	0.37	36.8	4.9	35.6
	10	0.37	36.7	5.2	35.6
	11	0.38	37.1	5.1	35.9
	12	0.37	37.1	5.0	35.9
	13	0.42	37.0*	4.8	35.3
WHA	14	0.44	39.9	4.9	36.7
	15	0.27	40.5	4.9	36.6
	16	0.27	41.0	4.8	37.6
	17	0.34	37.3	7.2	33.5

*) double peak structure... see next slide

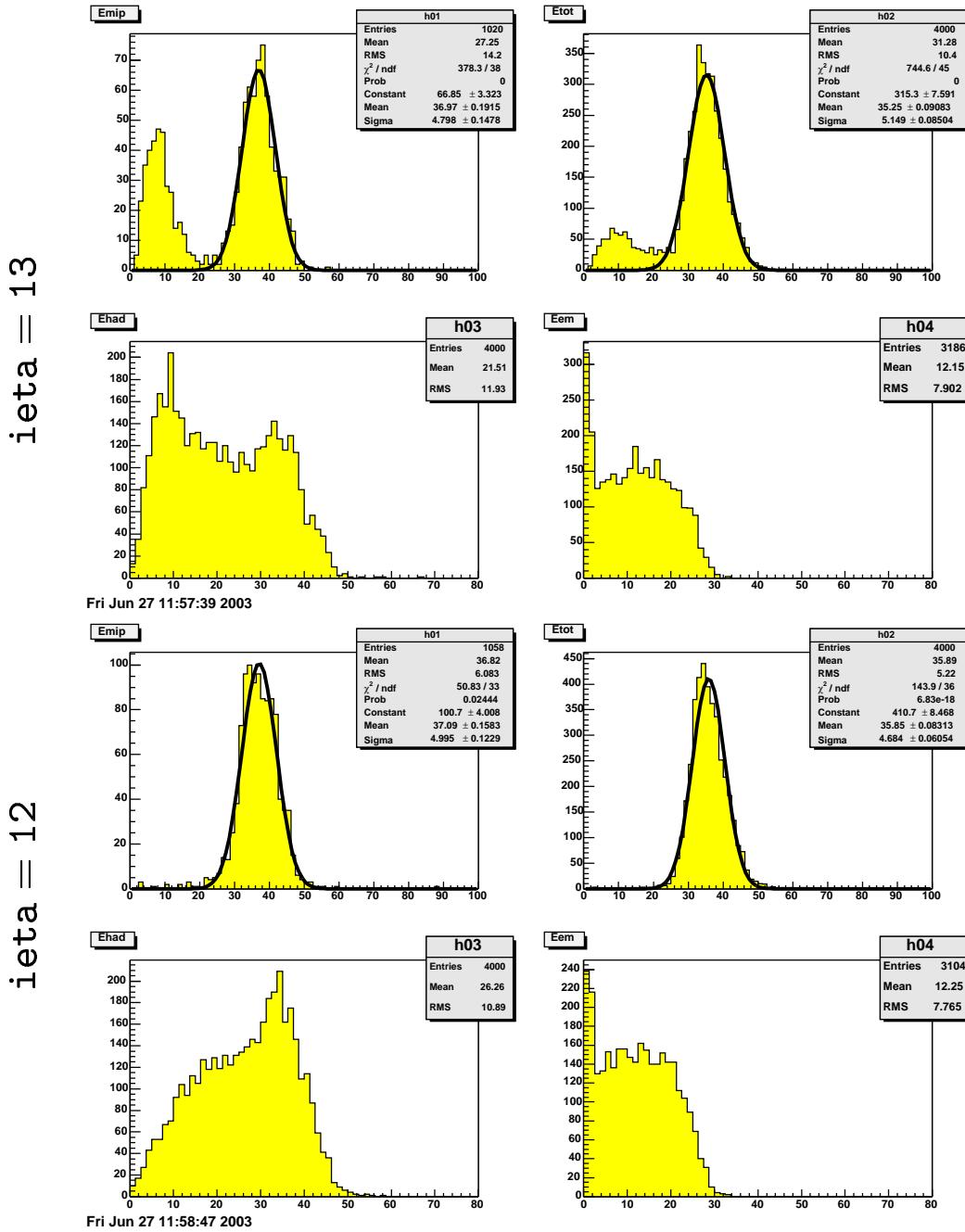
☞ Is GEANT tuned at all in the plug...?



Single π with GEANT



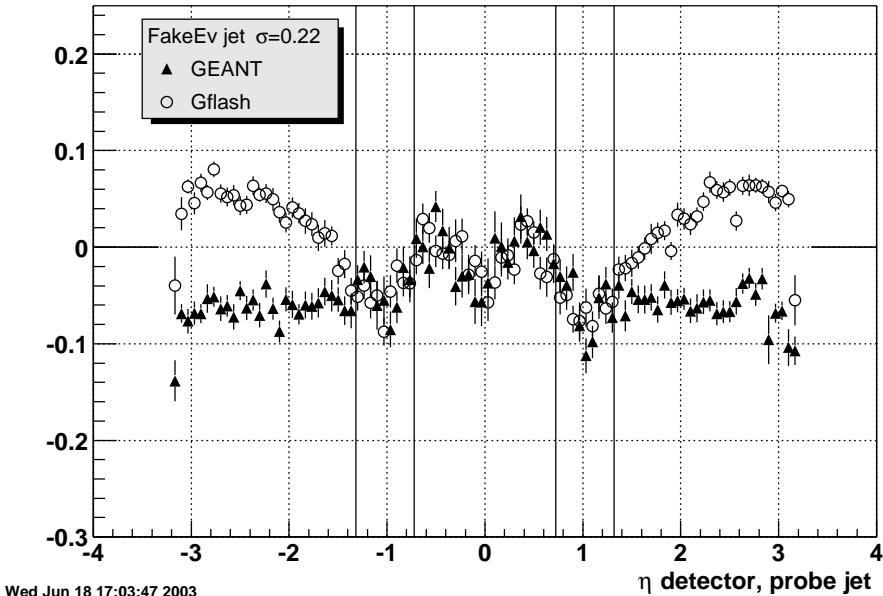
Shooting single π with $E = 57$ GeV in the plug at the center of each tower. Gflash turned off (IFLASH1=0 in gparm.F)



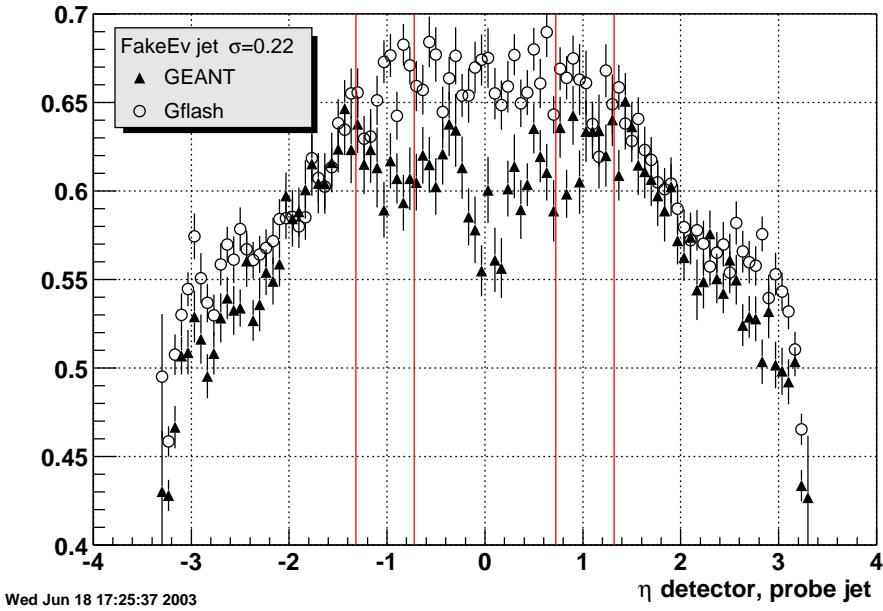
☞ Except T13 all the other towers respond like T12 (i.e. single peak)

Fake dijet balance and EM fraction with Gflash turned off (IFLASH1=0 in gparm.F)

Fake_balance [R=0.7]



Fake_EMfrac



👉 Weird illustration of complementarity: balance OK in central only but EMF OK in the plugs only?!



Comments



- ❖ The event display doesn't show anything wrong (indexing, etc are OK)
- ❖ In touch with Pierre about the GEANT issue
- ❖ In touch with David Ambrose (Penn) for help/continuation
- ❖ Minimum bias Stntuples down to tower 12,13 ready but stats is not adequate
 - possible to go down to $|\eta| \simeq 2.5$ (with reviewed analysis)
 - request for 1M min. bias events data (track trigger) + MC
- ❖ Meantime gonna try some intermediate parameterization of low-E region with real MC jets

A couple of timely references:

- ❖ 1066 — Single Pion Response in the Central Calorimeter
- ❖ 1344 — Update on Central Calorimeter Response to Pions and Tuning of QFL
- ❖ 4688 — A Proposal to Upgrade the Calorimeter Shower Parameterizations for RUN 2
- ❖ 5703 — Isolated, Low Momentum Hadron Response in the Central Calorimeter
- ❖ 6903 — Calorimeter Response to Isolated High PT Tracks