Simulation Overview

Rob Snihur (McGill)
for the Simulation Group
Leaders: Soon Yung Jun, Andreas Warburton

- MC production update
- Simulation updates since 5.3.4
  - CPR2
  - PES
  - z vertex
  - Not discussed:
    - Migration to GCC 3.4.3 (Soon Jun, Pasha Murat)
    - Standardized LesHouches interface for ME (Soushi Tsuno)
    - cdfSim runs with MaxOpt (Soon Jun, Pasha Murat)
    - Validation framework (Antonio Sidoti, Rachid Mazini)
- Other activities

MC Production: Concatenation "on-the-fly"

Rob Snihur

- Realistic MC = run dependence (calibs, detector config., beam, lumi.)
  - Some runs produce small output files
  - Concatenate output files for optimal mass-storage use
  - Inefficiencies in disk usage, transfer times, concatenation jobs, human communications
- Solution: Run concatenation in the same job as simulation (on-the-fly)
  - Temporary files stored on worker node disk
  - Adjustable output file target size (~1 GB) ➔ requires >2GB per job
  - Job delivers output files directly to tape logger ➔ tiny buffers required
  - Built-in error recovery for failures in simulation & output transfer
- Average user can do it on CAF, desktop, etc.
  - Updating documentation
- Generate MC at multiple DCAFs
  - Some DCAFs have different configurations (FBSNG vs. Condor, Red Hat vs. SL, disk, etc.)
- In progress: replace DFC tape logger with SAM

MC Production status

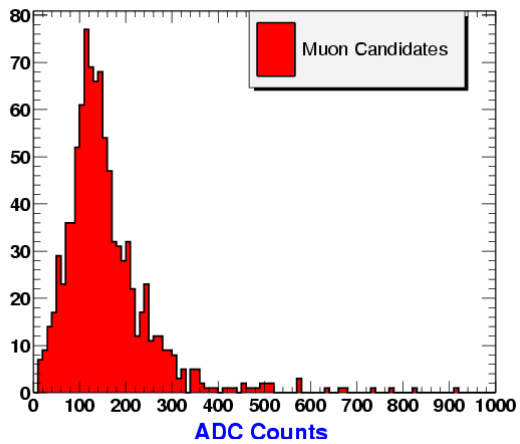
Bryan Caron, Rachid Mazini, Rob Snihur, Andreas Warburton

- Complete status at http://www-cdf.fnal.gov/internal/mcProduction/Priority_2005_Winter.txt
- Almost completed all pending requests, welcome more
  - Contact your friendly MC representative
    - Daniel Whiteson – top
    - Kathy Copic – EW
    - Ken Hatakeyama – QCD
    - Sunil Somalwar – Exotics
    - Saverio Dauria – b
- 513M events generated since May 2004
- 2.5M processed with concatenation on-the-fly
- Total of ~30M produced in last ~4 weeks (Toronto, Alberta, DCAFs)
  - 12M already @ FNAL, and 14M still waiting in Toronto
  - Largest sample ever 120M (0.2% filter): B_semimuonic_581
    - 2 weeks on ~300 CPUs
- Toronto farm upgrading to SL304
  - Validation underway (R. Mazini, Antonio Sidoti)
- Validating 6.1.1 release (R. Mazini, A. Sidoti, Librarians)

Since 5.3.4: CPR2 Simulation

Jun Suhk Suh, Steve Kuhlmann

- Run number switch works, >190000 gets new detector
- Simulation is convolution of MIP histogram with NMIPS from Geant.
- More improvements planned



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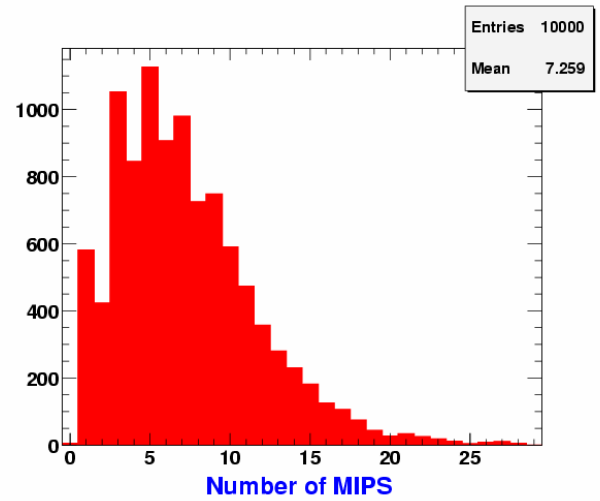

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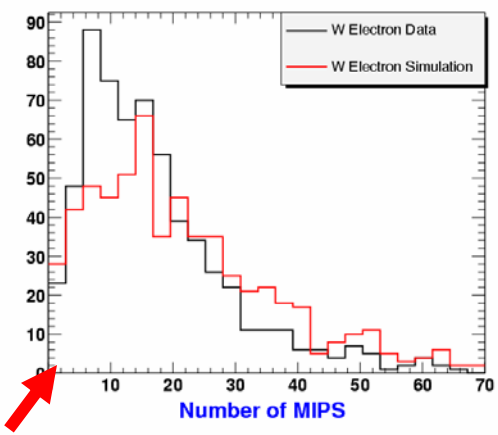
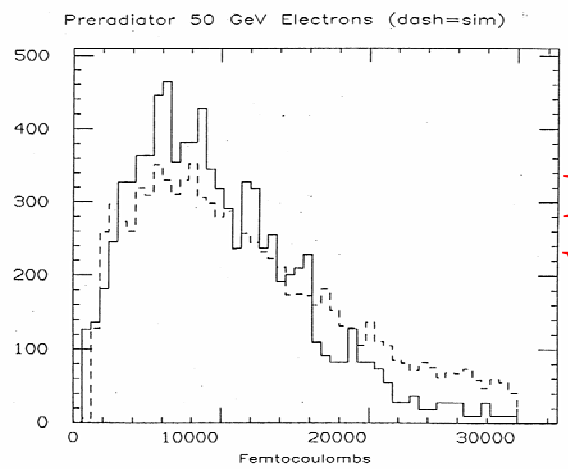


Typical Cut, Analyses Not Sensitive to Details



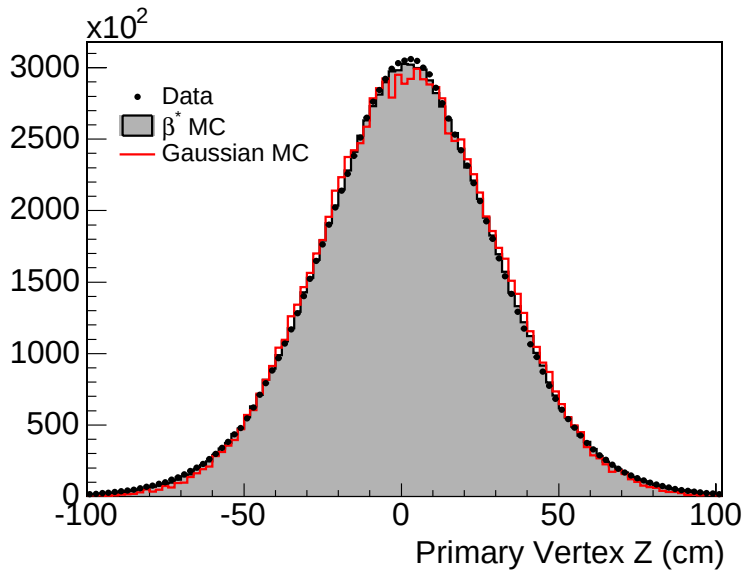
Run I Version

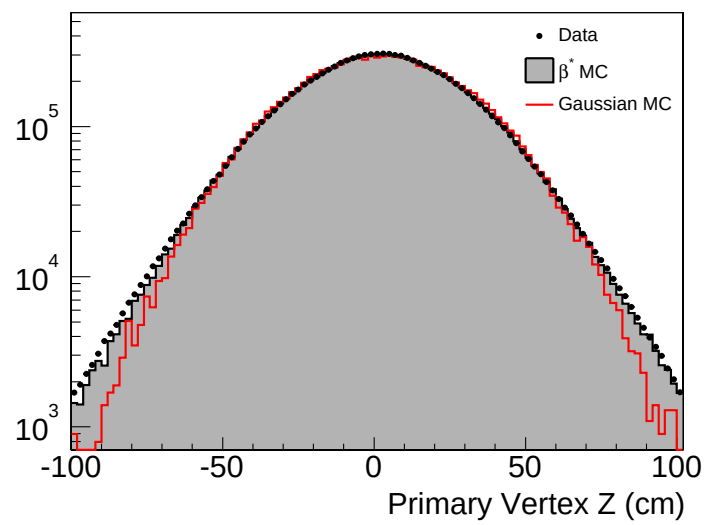
Since 5.3.4: Z vertex

Jason Galyardt, Soon Yung Jun, James Russ

longitudinal luminosity distribution:

$$\frac{dL}{dz} \propto \frac{e^{\frac{-(z-z_0)^2}{2\sigma_z^2}}}{1+\frac{(z-z_{min})^2}{\beta^{*2}}}$$

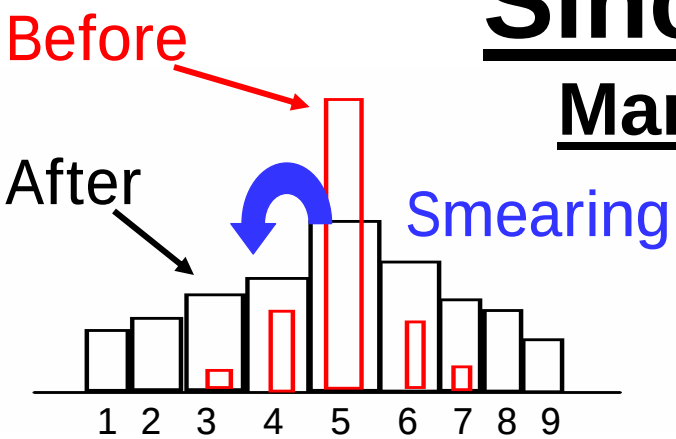




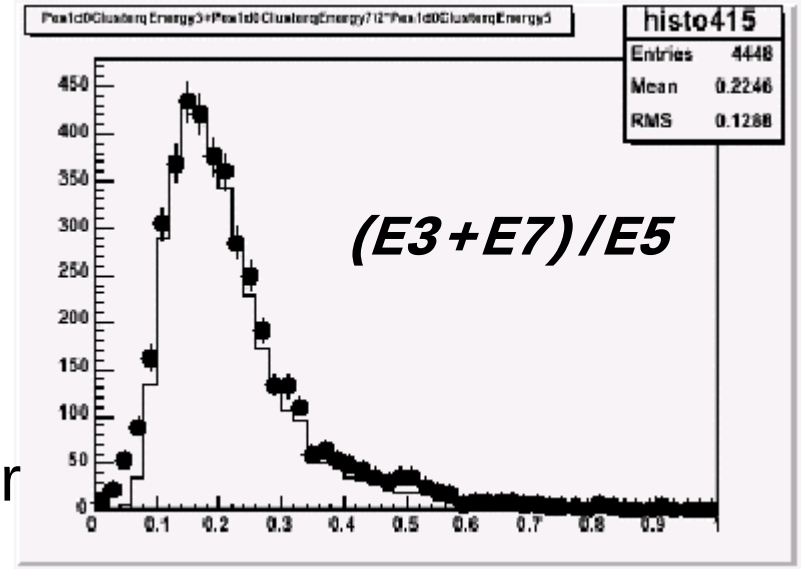
- Parameters from run-dependent fit to minbias data
- Need procedure for including new runs

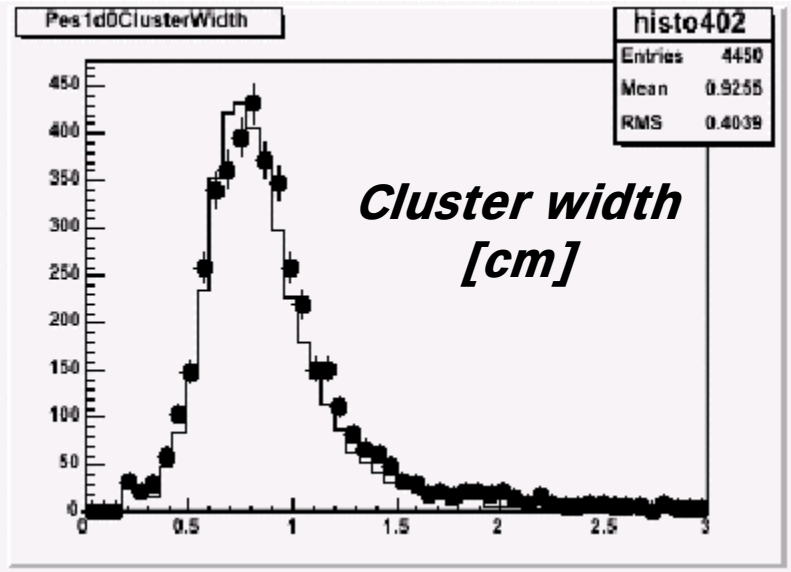
Since 5.3.4: PES

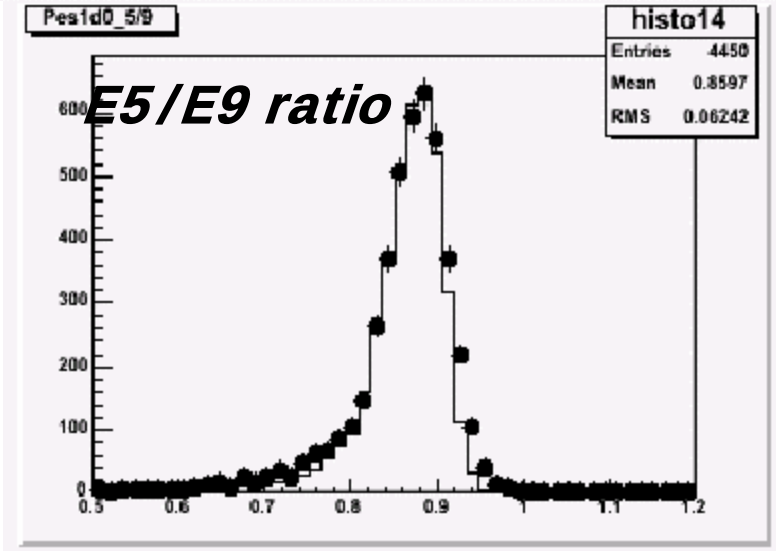
Martin von der Mey



- Gflash shower profile too narrow
- 9 strips in one Pes/Pes2d cluster
- Redistribute energies inside cluster







Other activities

- UserInfo block for p_T-hat, etc. (Jason Galyardt)
- Writing SVT beamlines into DB (Alessandro Cerri)
- Updating EvtGen package (Juerg Beringer, Rick Tesarek)
- Refining calorimeter responses
  - hadronic shower lateral profile (Pedro Fernandez)
  - energy scale w/ single track data up to 20 GeV (Shawn Kwang)
  - phi-crack response for electrons (YeonSei Chung)
- L00 charge deposition model (Nick van Remortel – Helsinki group)

Summary

- MC production finished all requests
  - Implemented concatenation on-the-fly
  - Faster delivery of completed samples
- Major improvements in simulation since 5.3.4
  - CPR2
  - PES
  - Z-vertex
- Other improvements
  - UserInfo block
  - SVT beamlines
  - EvtGen
  - Calorimeter response
  - L00

Backup

CPR2 Simulation overview

Jun Suh is the main developer.

Run number switch works, >190000 gets new detector

Simulation of old detector was only used for 1 plot!

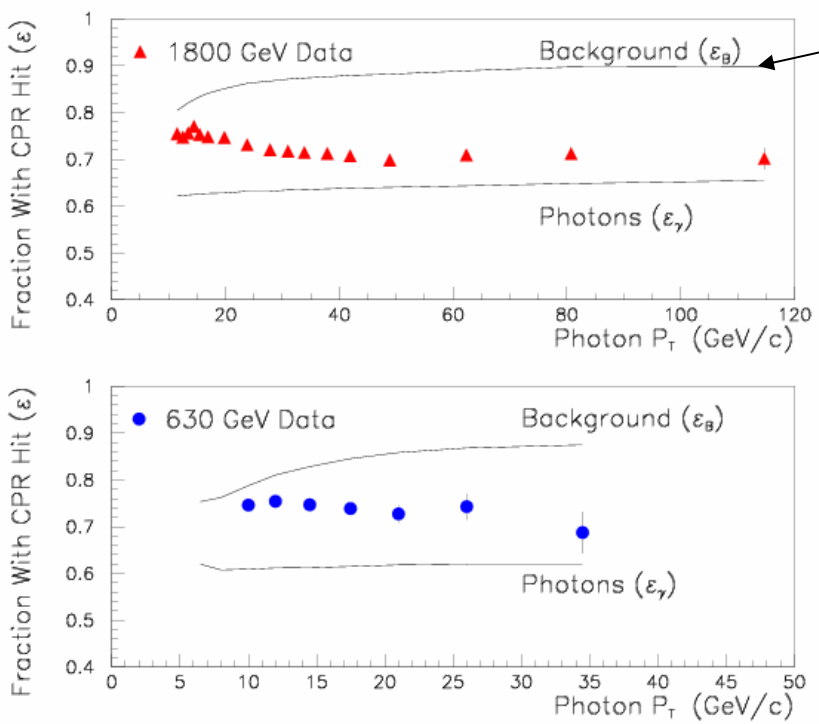


Figure 12: A comparison of the 630 and Run 1b fraction of events with a CPR pulse height greater than 500 fc.

How often does at least one of the two photons from a π° give a 1 MIP hit?

Analyses with electrons used data for all studies. Conversions, Pions from Ks, …

CPR2 Simulation overview

These curves depend on geometry and decay kinematics, not much more.

Geometry looks good in new simulation.

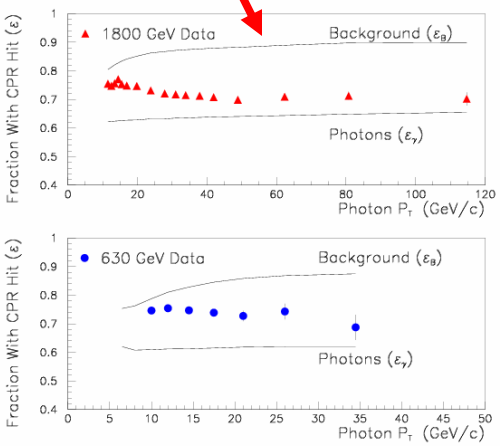


Figure 12: A comparison of the 630 and Run 1b fraction of events with a CPR pulse height greater than 500 fc.

Z→

ϕ ↓

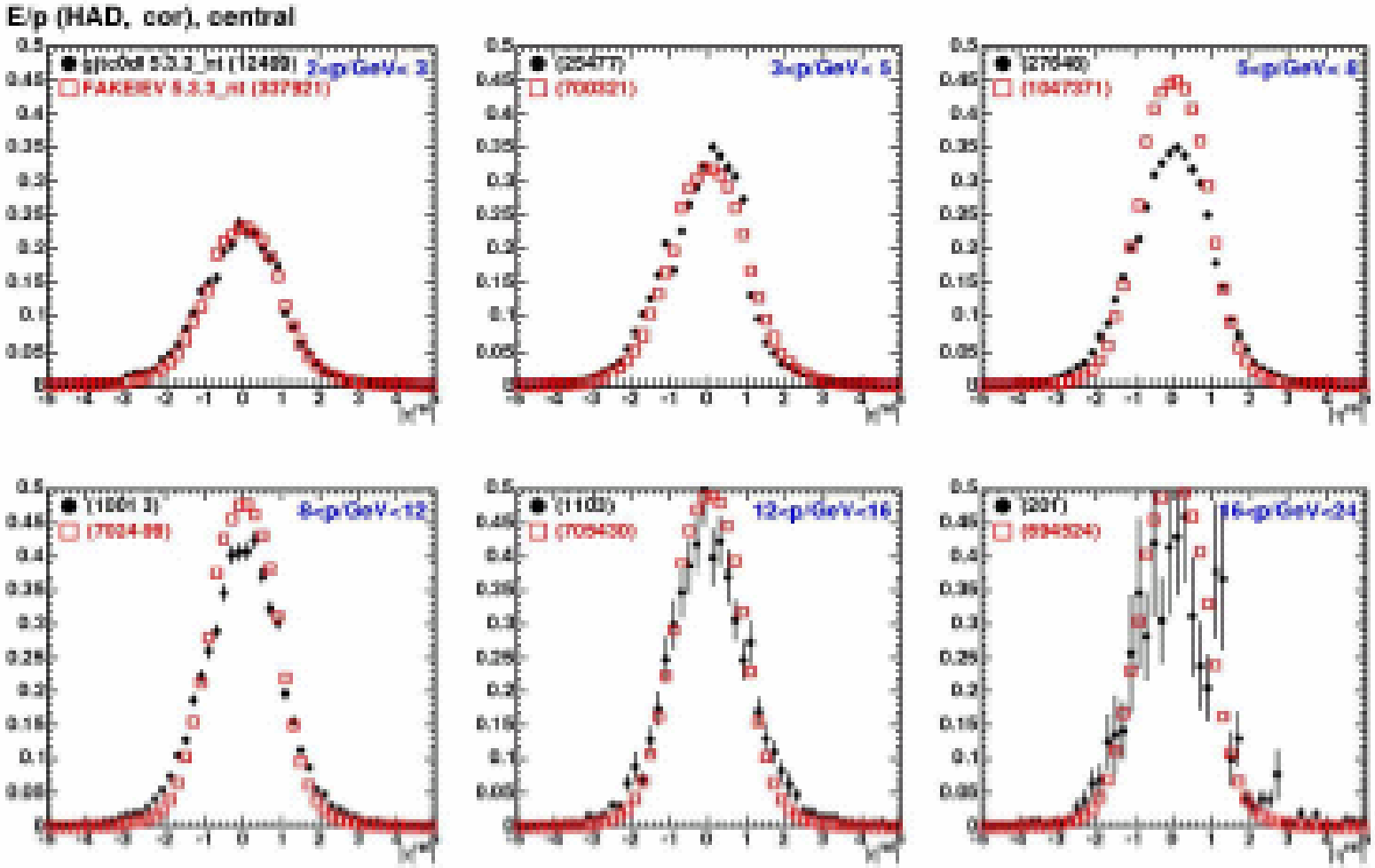
0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51
1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52
2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47	50	53

Pad numbers for CPR2. These are the same for the east and west sides.

Hadronic shower lateral profile

Pedro Fernandez

E/p (η^{rel}) vs. p (HAD)



Hadronic shower lateral profile

Pedro Fernandez

Conclusions

- Kink in HAD profile plots probably due to extrapolation effects in events with tracks stemming from displaced z vertices
- Kink structure is different for data and MC
- Cleaner definition of HAD tower coordinates might be necessary
  - More stringent z vertex cut to reduce extrapolation effects
  - Minimum EM/p requirement to enrich sample with hadronic showers starting at EM surface
- Momentum weighting of MC tracks within p bins might be necessary in order to account for power law in data spectra

For tuning of lateral profile in central part:

- Consider tower 1,2,3,4 (stay away from cracks)
- Tune distributon: $E/p(\eta^{tow})$, $\eta^{tow} = 0, \pm 1$
- Momentum bins and number of usable isolated tracks (gjtc0d/gjtc01)

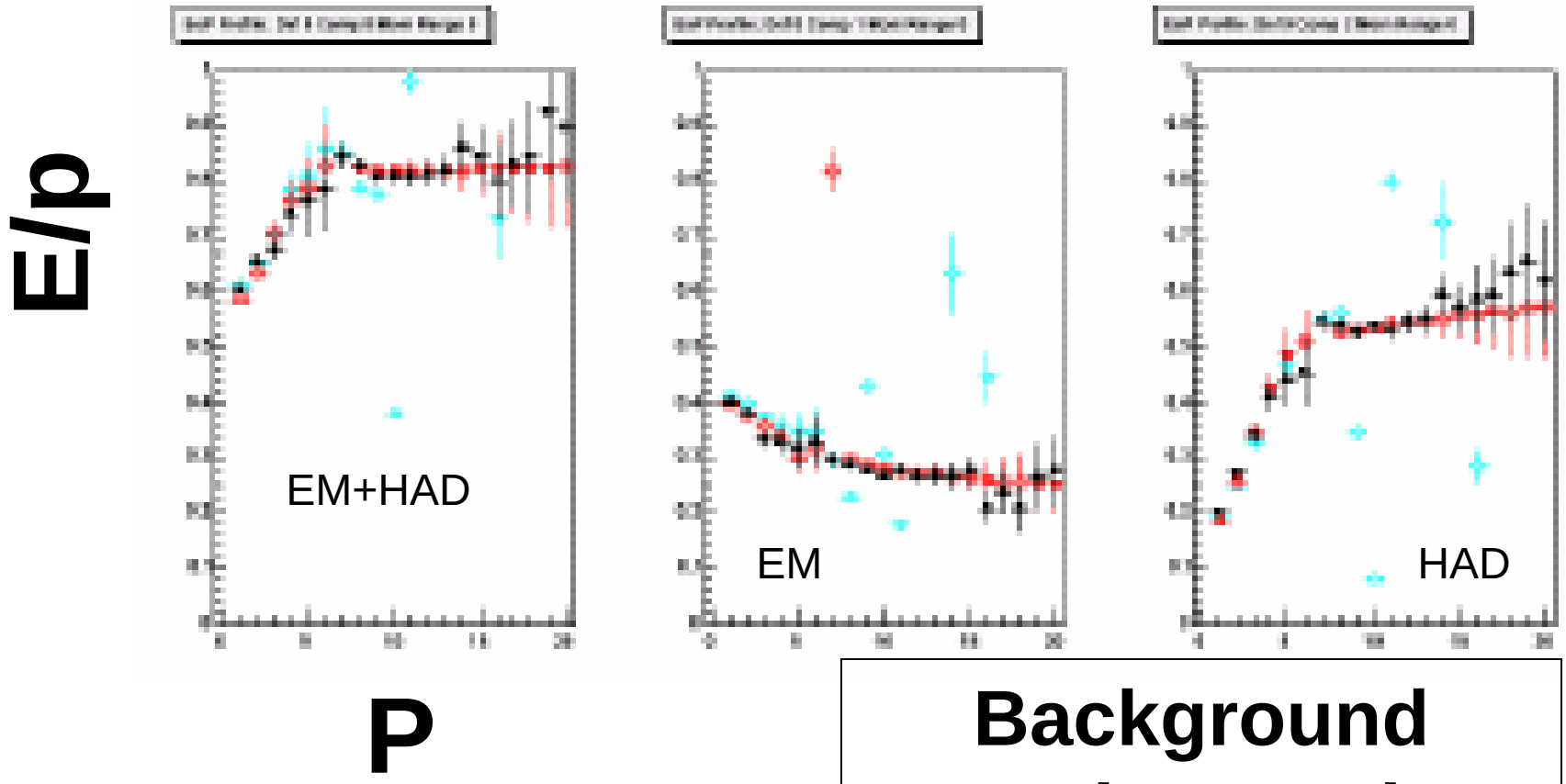
3-5 GeV	(15k/ 0.7k)	5-8 GeV	(17k/ 4k)
8-12 GeV	(6k/ 8k)	12-16 GeV	(0.8k/ 0.8k)
16-24 GeV	(0.1k/ 0.2k)		

- First tuning iteration is on the way ...

Energy scale w/ single track data up to 20 GeV

Shawn Kwang

Ref: CDF Note 7060
http://www-cdf.fnal.gov/~skwang/JetCorrections/



Background subtracted