Plans for Improving the Calorimeter Simulation

P.A. Movilla Fernández
(LBNL)

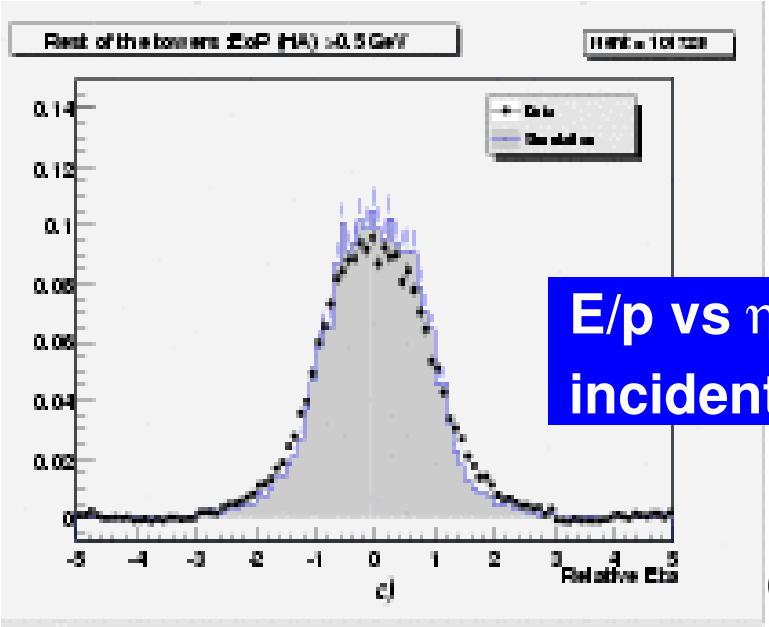
Simulation Meeting Mar 24, 2005

Short-Term Goals (3 months)

Three independend projects:

1) Tuning of the hadronic lateral shower profile (Pedro)
   - use minimum bias / single track trigger data
   - start with E/p at p=5 GeV/c and p=10 GeV/c
   - check if parametrization of energy dependence fits data p<5GeV
   - consider Central and Plug Calorimeter separately

In the past: reasonable tunes only available for p<2.5GeV/c
(statistics limited)



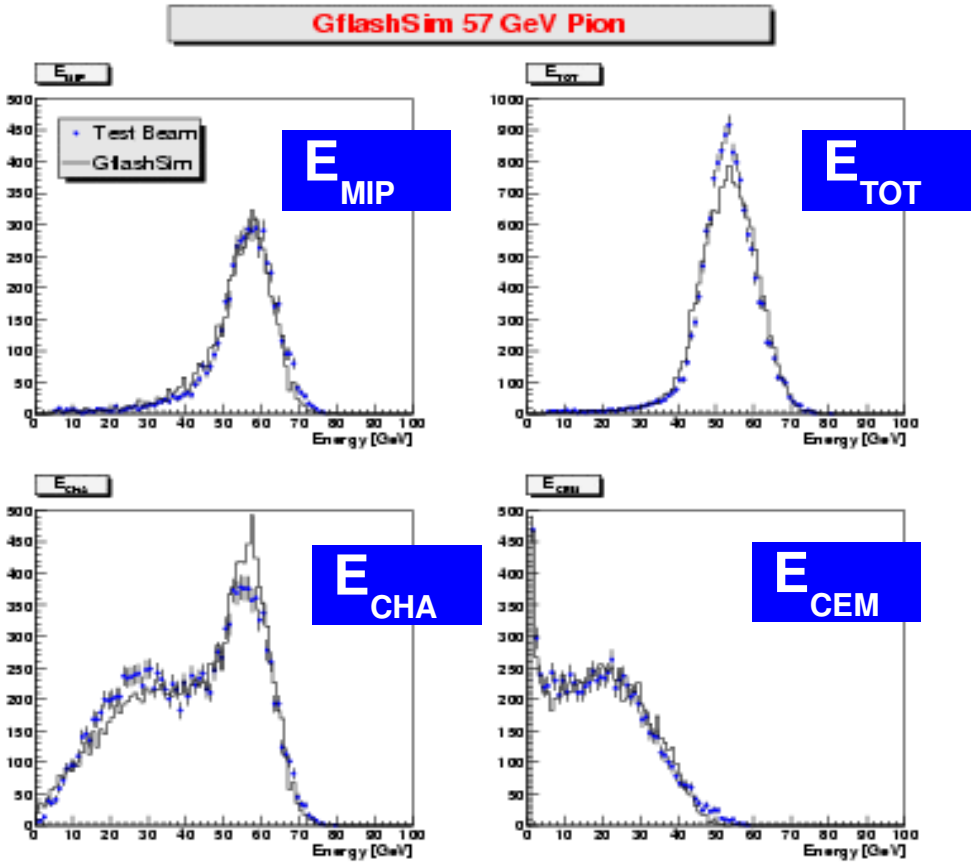
E/p vs η_{rel} incident hadron

CDF 5886

Short-Term Goals (cont'd)

2) Study of the energy response at high momenta (Shawn)

- use minimum bias / single track trigger data with tracks up to p~20GeV/c in the past: only up to 5GeV/c
- study/tune average responses and shapes of MIP/TOT/HAD/EM
- verify test beam tuning
- reduce uncertainty of single track response for p>10GeV/c (by now: guess via extrapolation)



test beam data (CDF 5886)

Short-Term Goals (cont'd)

3) Tuning of electron energy responses (Yeon Sei)

- Confirm/refine lateral EM lateral response
- high-and low-pt electrons
- studies of energy response around phi cracks:
  consider signal vs. detector eta w/o imposing
  CES fiducial requirement

Need to prepare stntuples for current and future analyses with all relevant data

Mid-Term Goals (6 months)

1) Refine Central/Crack/Plug average responses (Shawn, Pedro, Dave?)
   - e.g.: introduce eta parametrization of tuning
2) Improve response at the very far forward region (|eta|>2.5) (???)
   - important for precise MET measurement
   - it would be useful if Exotic people recruit a person a.s.a.p. (needs some training period) in order to boost this task efficiently
3) Evaluate new tuning using di-jet balance technique (jet20, jet50) (Ken?)
   - mean to estimate uncertainty of single track response

Status...

- Newcomer coming from top mass analysis
- Currently ACE for next 9 weeks
- Started with using/understanding tools
  - cdfSim, STNTUPLE, Gflash code, JTF library
- Started looking into FAKEEVT vs. STT data (gjtc0d)
- Try to get feeling how shape of E/P distributions depend on parametrization of the lateral profile

Lateral Shower Profile in Gflash

E: energy of incident particle
x: shower depth
r: radial distance from center of shower perpendicular to shower direction
f: lateral profile of energy distribution

$$f(r) = \frac{2 r R_0^2}{(r^2 + R_0^2)^2}, \int_0^\infty f(r)\,dr = 1$$

core

spread

$$\langle R_0(E, x) \rangle = \left[R_1 + (R_2 - R_3 \log E)\, x \right]^n$$

$$\sigma^2_{R_0}(E, x) = \left(S_1 + (S_2 - S_3 \log E)\, x \right) \langle R_0(E, x) \rangle$$

R_0: log-normal pdf
n=1 for hadronic showers

Tuning parameters: R_1, R_2, R_3, S_1, S_2, S_3

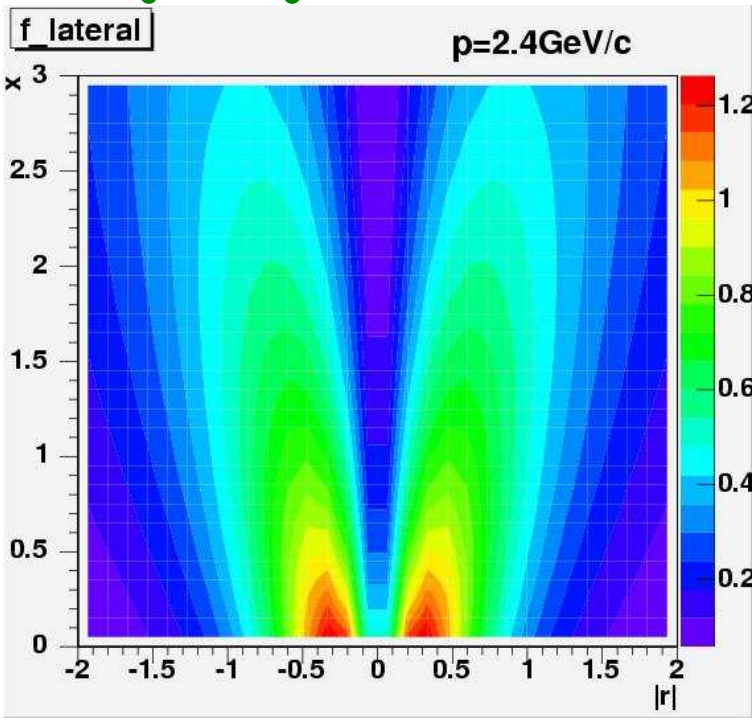
Parametrization

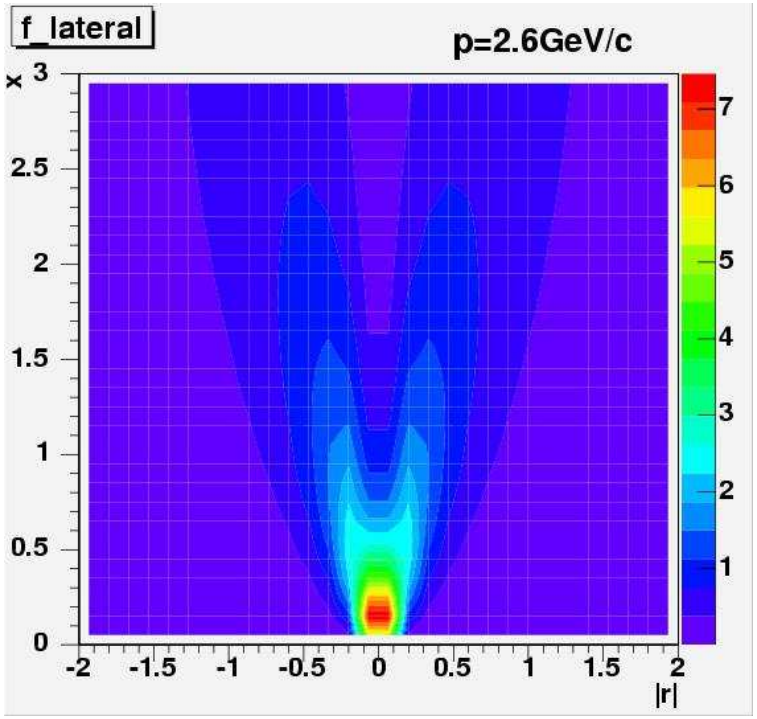
Current parametrization in Gflash:

p>2.5GeV/c: R_1=0.0194, R_2=0.407, R_3=0.061 (H1 default)

p<2.5GeV/c: R_1=0.490, R_2=0.407, R_3=0.065

Let's set R_0=<R_0>, assuming no fluctuations:





Want to get rid of this funny discontinuity at 2.5 GeV/c!