

Hadrons in the EMCal

Bruce Baller

June 26, 2003

Funky Electrons

Possible Scenarios

From Last week's talk

- Lepton hemisphere
 - Internal brehmsstrahlung in the struck nucleus
 - Diffractive processes (ρ production)
 - Atypical large hadronic energy deposition in the EMCAL
- Nuclear hemisphere
 - Strange angular correlations (heavy mass states?)
 - Atypical large hadronic energy deposition in the EMCAL

Focus of today's talk

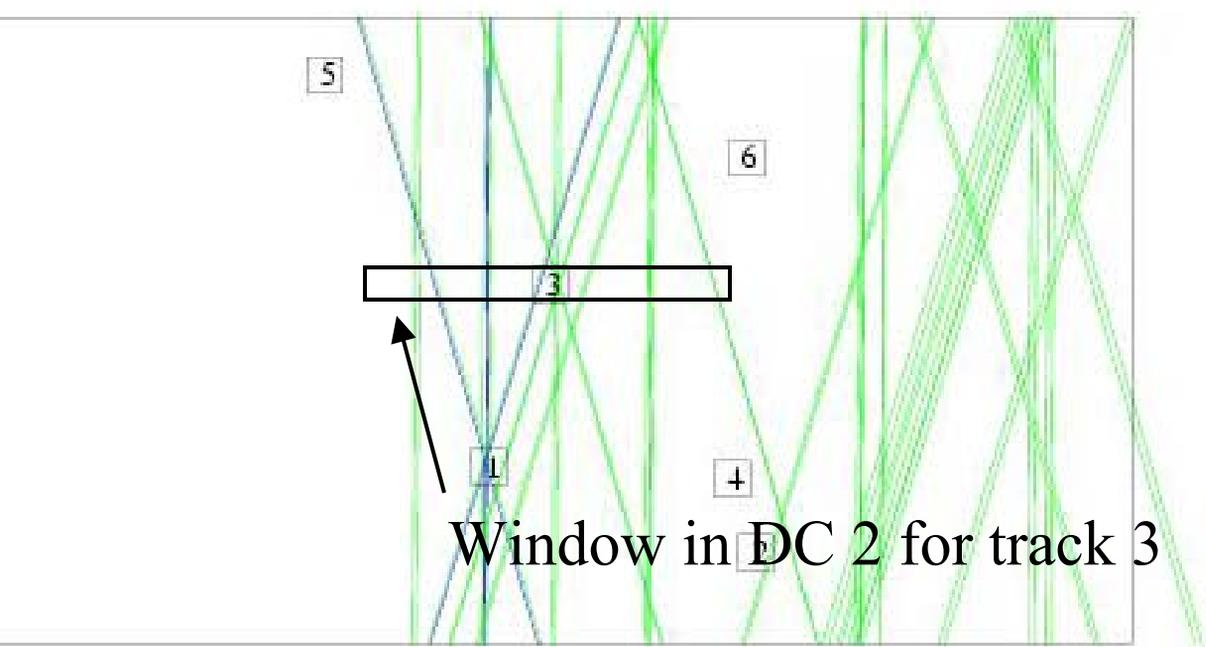
What is the typical hadronic energy deposition in the EMCAL?

Data & MC track fitting

- DC track reconstruction & matching to SFT is not very good
- Manual fitting/matching is not reliable for moderate DC hit densities
- New DC track reconstruction routine (still under development) should improve matters
- Procedure
 - Project emulsion/SFT tracks into each DC
 - Create a window around the track position in each DC
 - Y window half size = 10 cm
 - X window half size = X expected for 1.5 GeV
 - Form space points (X,Y,Z) for all DC hits within the window
 - Momentum fit each point
 - Find hits in other DC planes along trajectory
 - Require >0 hit/DC and >8 DC hits
 - Select track with most hits ($\chi^2 < 20$) or best χ^2 if same # of hits

Example: 3110_27773

DC 2
/N



EMDCANAL: Checking track 3

Number of space points 9 16 31

try	DC	isp	chi	mom	#dchit	#trkhit
1	3	1	12.3	-35.6	10	19
2	3	2	3.7	-48.3	10	19
3	3	5	1.8	-64.1	10	19
4	3	6	16.8	-52.9	10	19
5	3	11	17.5	-51.9	10	19
6	3	19	11.9	-38.6	10	19
7	2	5	12.8	-68.0	10	19
8	2	9	10.0	-46.9	10	19
9	2	14	10.3	-68.5	9	18
10	1	5	12.2	-83.9	10	19

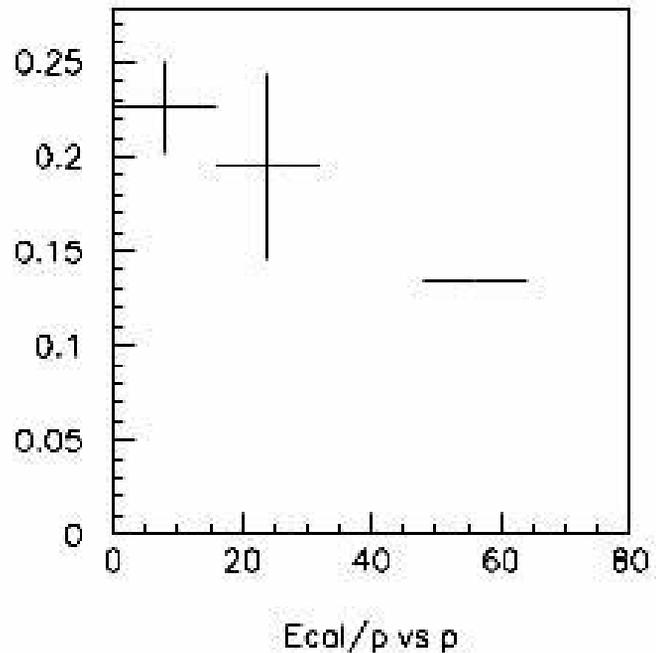
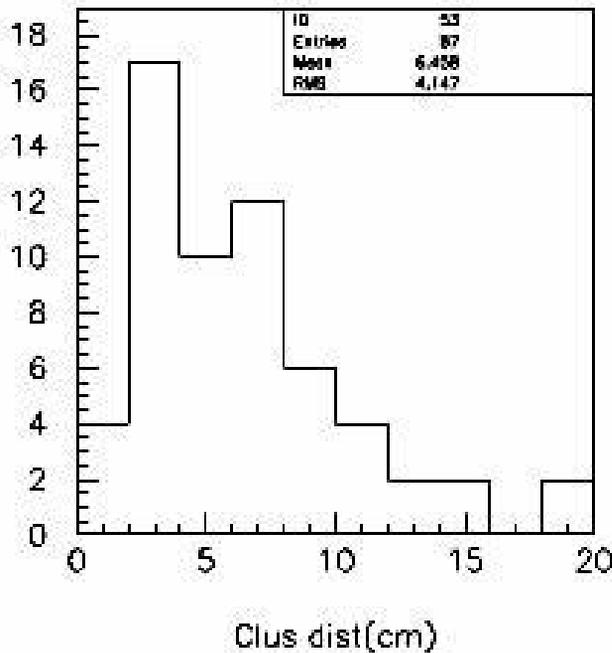
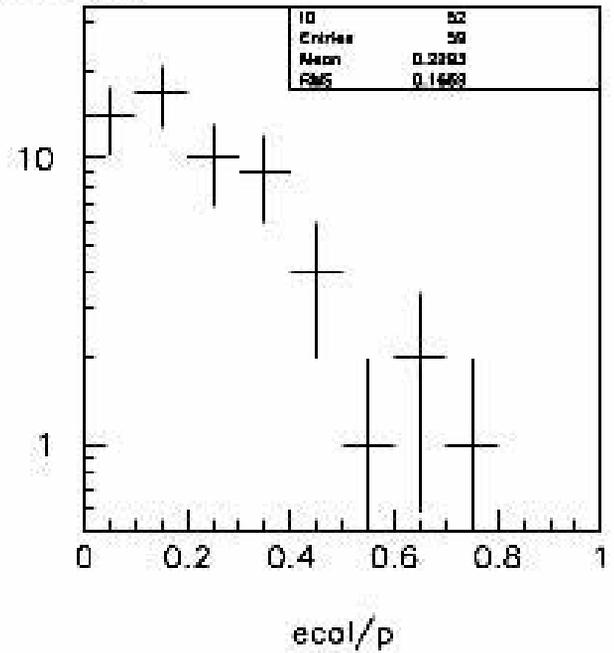
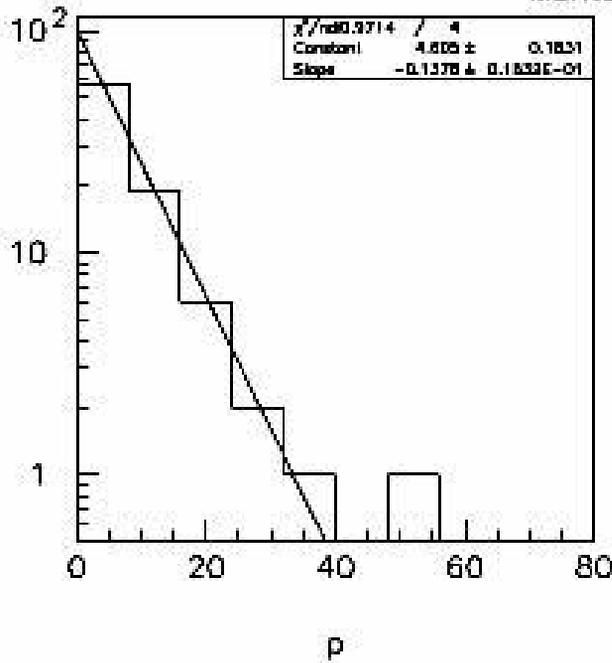
Best track 3 Chisq 1.76 mom= -64.1476669

Data & MC track fitting - 2

- Selected tracks for re-fitting by visually checking for DC space points that were not fit
 - Ignored tracks pointing to wide EMCAL showers
- Re-fit all Phase 1,2 events
 - NC 104 events
 - CCmu 181 events (didn't refit the muon...)
 - CCe 118 events
- Re-fit 1000 CCmu MC events
- Histogram primary track momentum
 - $N_{\text{seg}} > 2$
- Associate track with EMCAL cluster if $IP < 20$ cm
- Histogram E_{clus}/p for data and MC

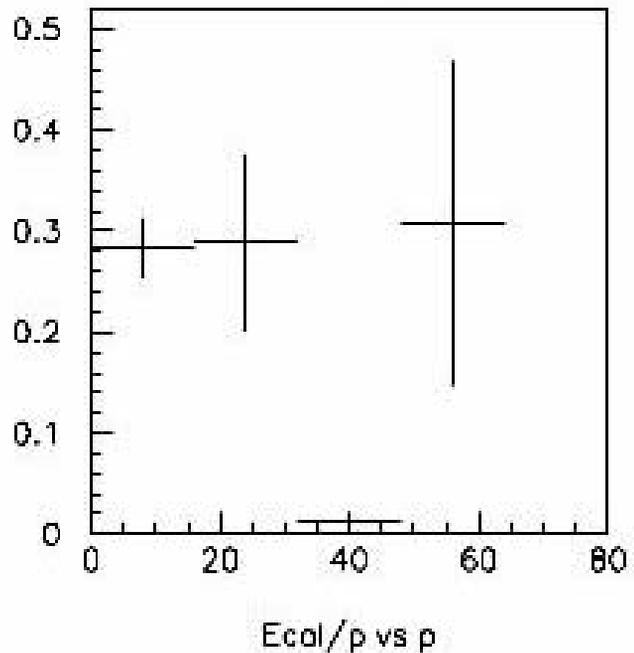
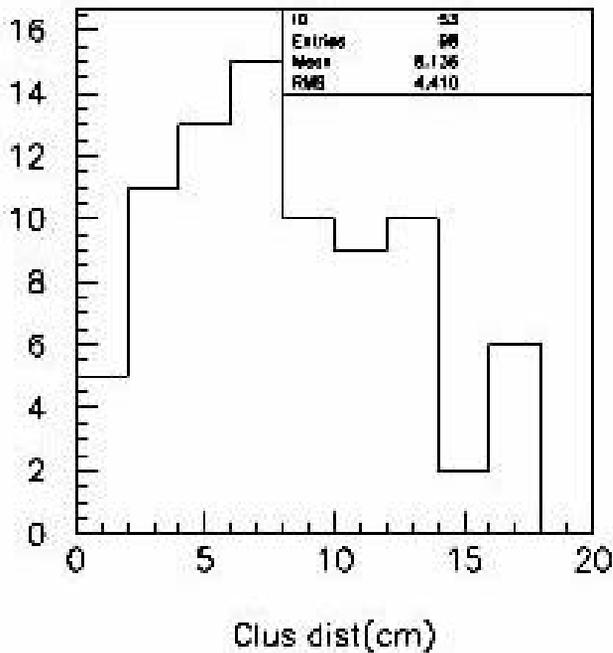
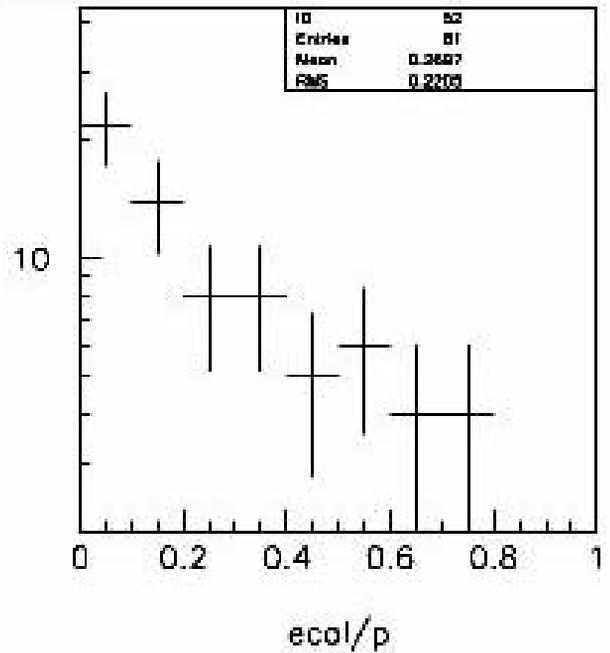
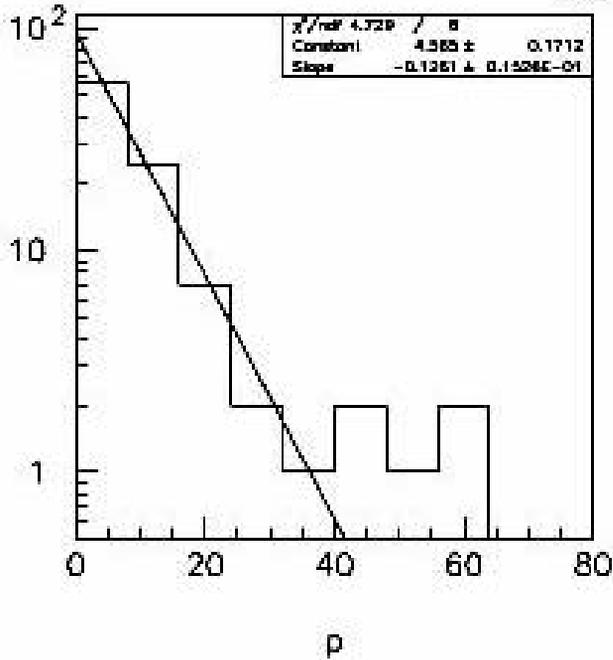
Assume all tracks are hadrons

Monte Carlo CCmu



On average MC primary tracks deposit
 ~23% of their energy in the EMCAL

CCmu Events



On average data primary tracks deposit
 ~27% of their energy in the EMCAL

The fraction is not momentum dependent

Check high momentum tracks

- Visually checked all hadrons with momentum > 30 GeV in CCmu and NC
- Removed some tracks (electrons, failed muon tag, wrong DC fit)
- Tracks are all cleanly separated from large EMCAL clusters, have good DC tracking with low DC hit density

P (GeV)	Eclus(GeV)	Fraction	
50	36	72%	
44	0.4	1%	
>100	18	<20%	
51	17	33%	<u>Ave 8%</u>
36	0.3	1%	
34	0.5	1.5%	
66	1.1	1.7%	

Summary

- Monte Carlo results on hadronic energy deposition in the EMCal made in “Funky Electrons”
 - 8% of hadrons deposit > 50% of their energy in the EMCal*
- Momentum fit 52 hadrons in CCmu sample
 - 11/52 (21%) tracks have $E_{clus}/p > 50\%$
- For NC & CCmu hadrons with momentum > 30 GeV
 - 1/7 (14%) have $E_{clus}/p > 50\%$
- MC results roughly consistent with data