



$\frac{\text{Energy}}{\text{Momentum}}$ Scale of 20 GeV/c Tracks in the Central Calorimeter

CDF Simulation Meeting
December 15, 2005

Shawn Kwang
with
Soon Yung Jun and Mel Shochet



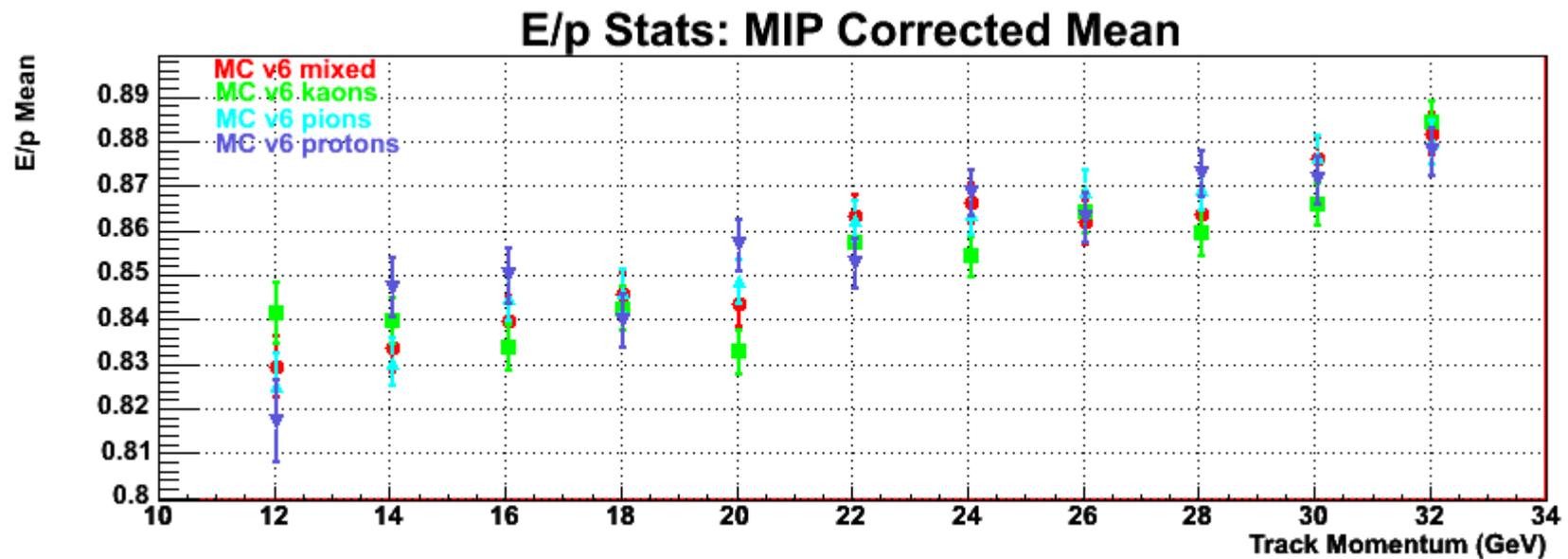
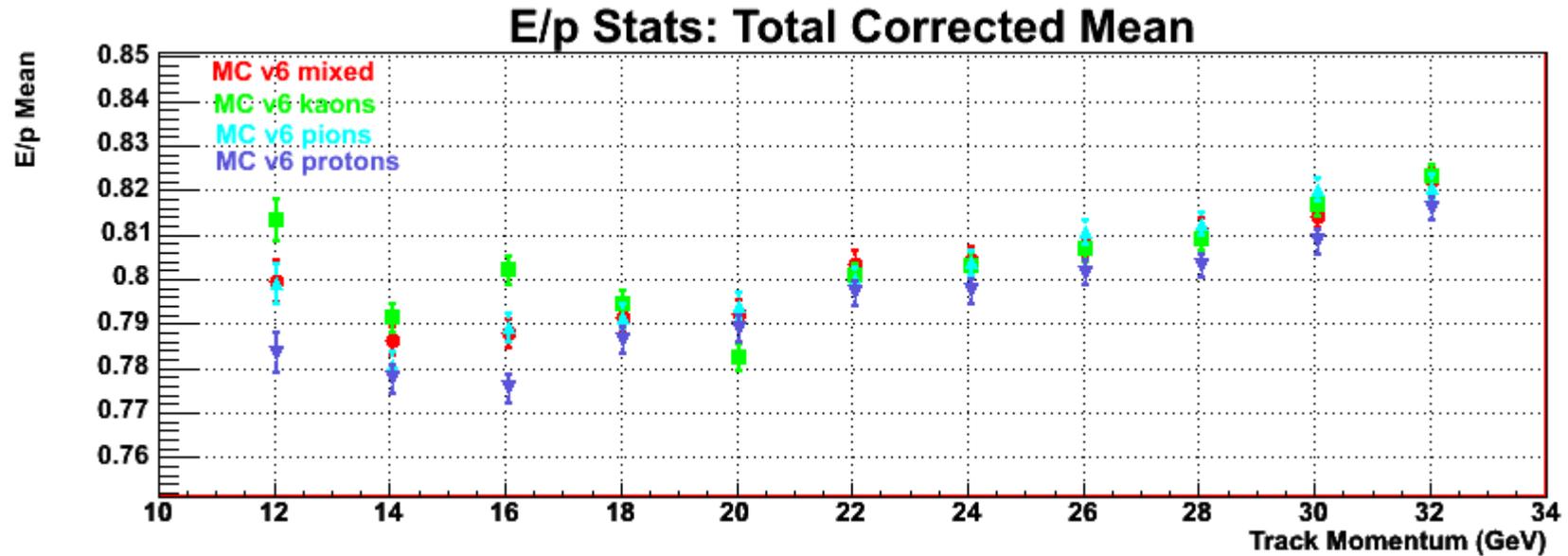
- ▶ We were charged with understanding the response in the calorimeter to high momentum particles
- ▶ Data used is 15 GeV/c single track trigger \sim 6 million events
 - ▶ gjtc0h_stt15 - special trigger taken over the summer
 - ▶ gjtc0d - older jet calibration data
- ▶ MC fake events generated with version 6
 - ▶ Includes Pedro's new lateral profile tuning at $p > 5$ GeV/c
- ▶ For each isolated tracks plot the:
 - ▶ EM (2x2), Hadron (3x3),
 - ▶ MIP (EM $<$ 670 MeV), and Total (EM+Hadron) energy over momentum of track.
- ▶ Fit the Total and MIP distributions to a converging Gaussian
- ▶ Plot the mean (and sigma) of the Gaussian as a function of track momentum

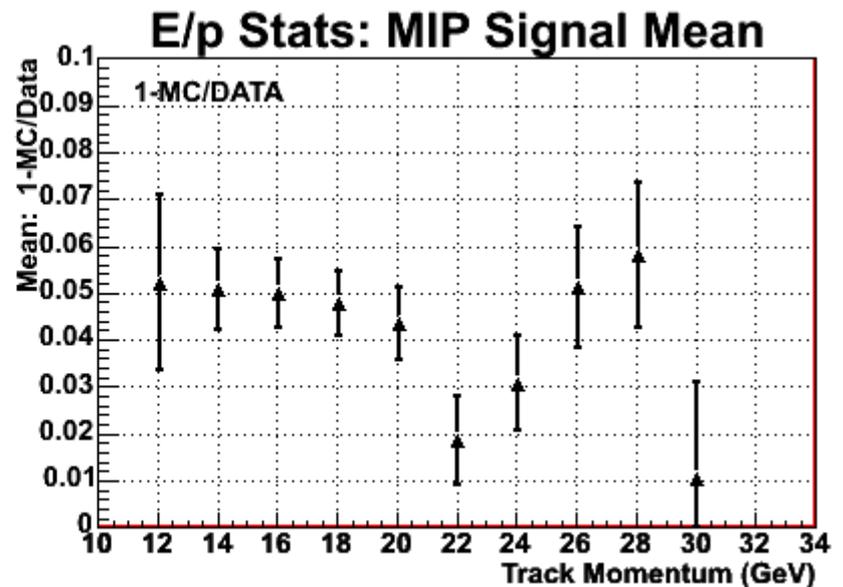
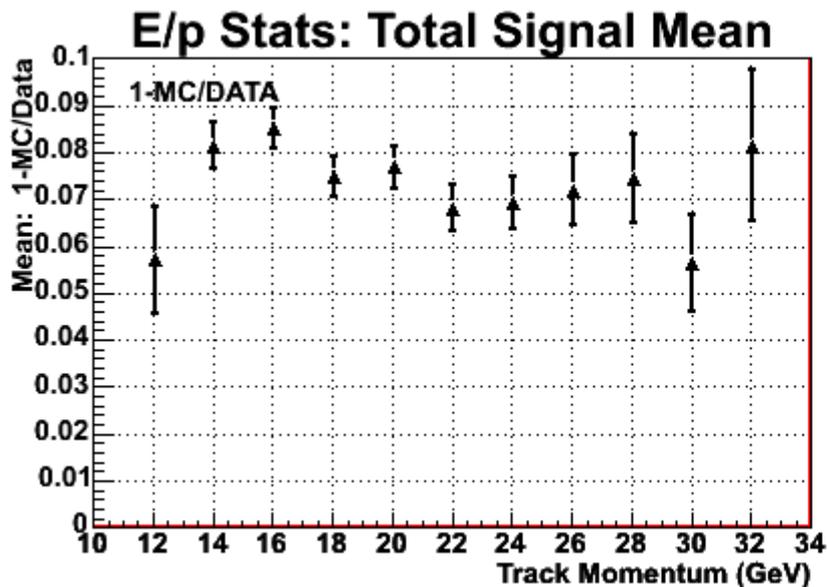
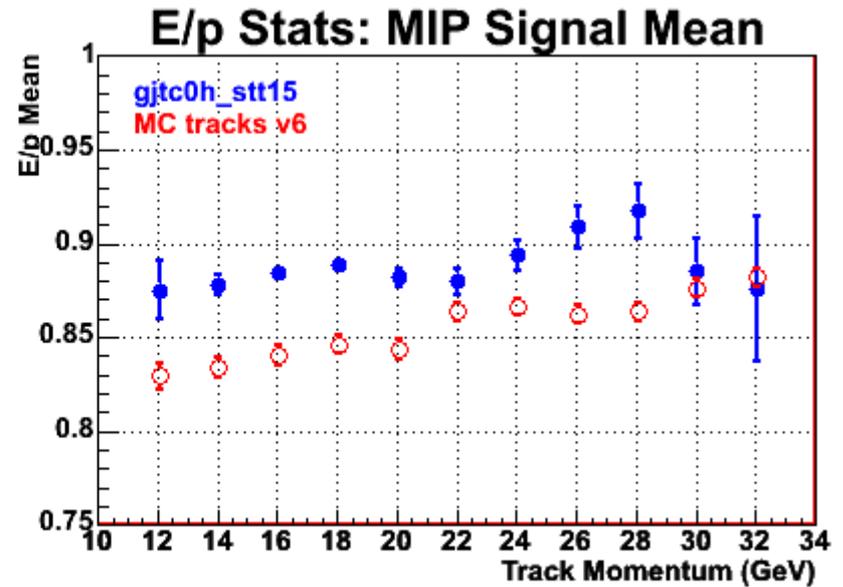
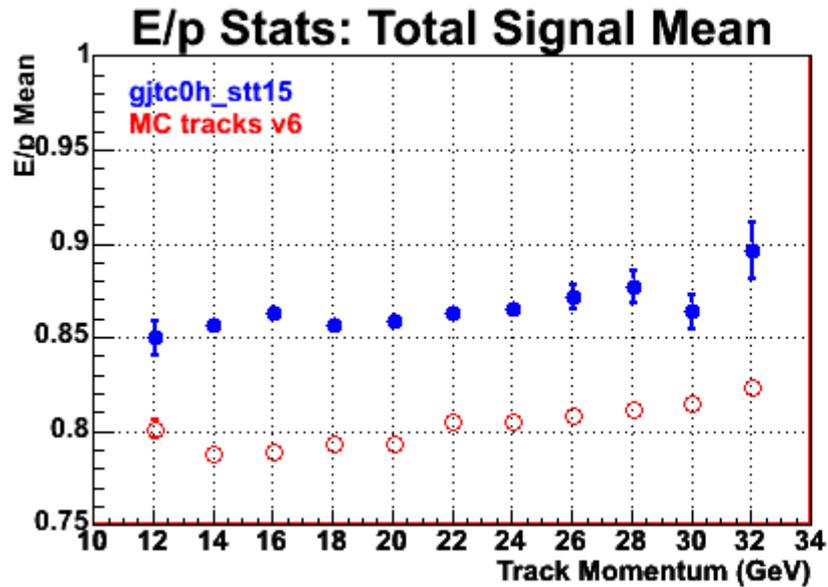


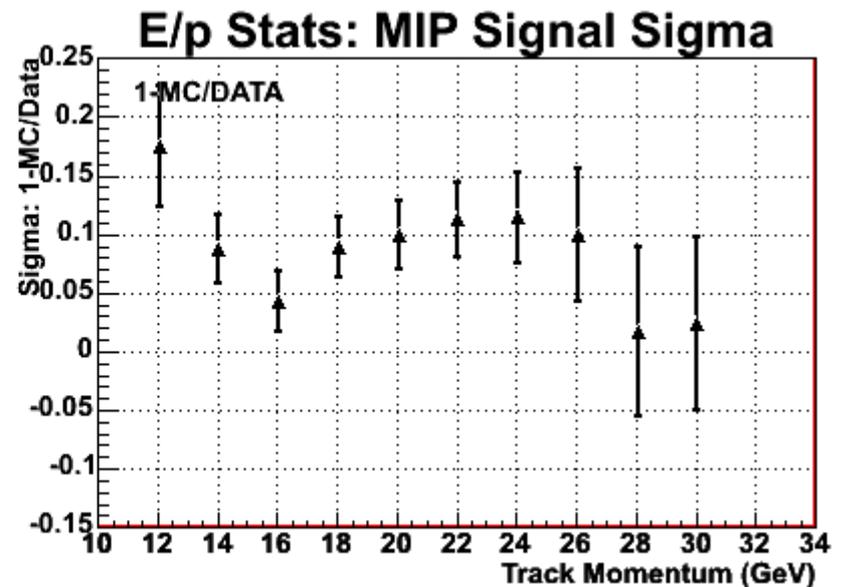
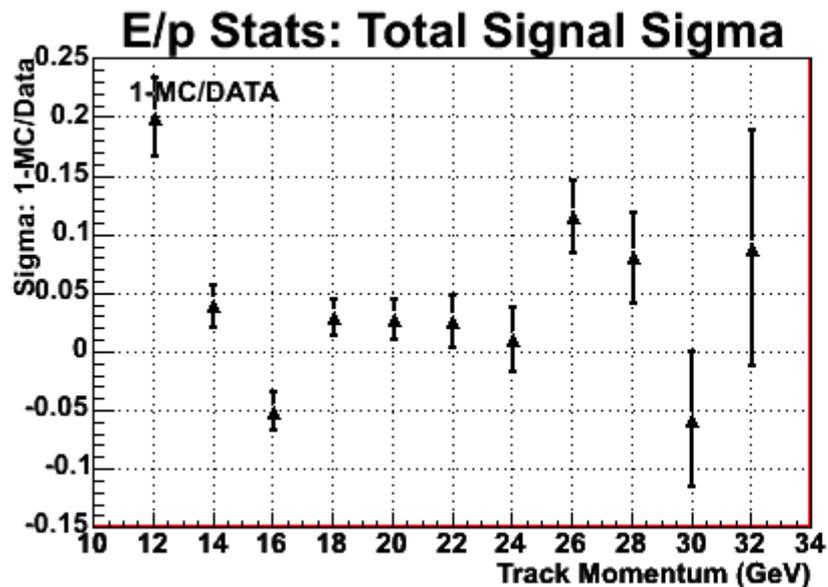
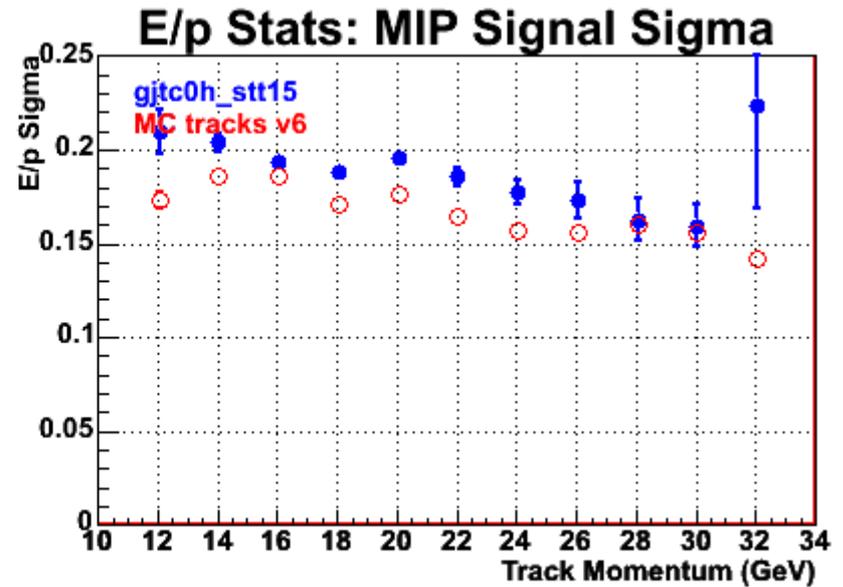
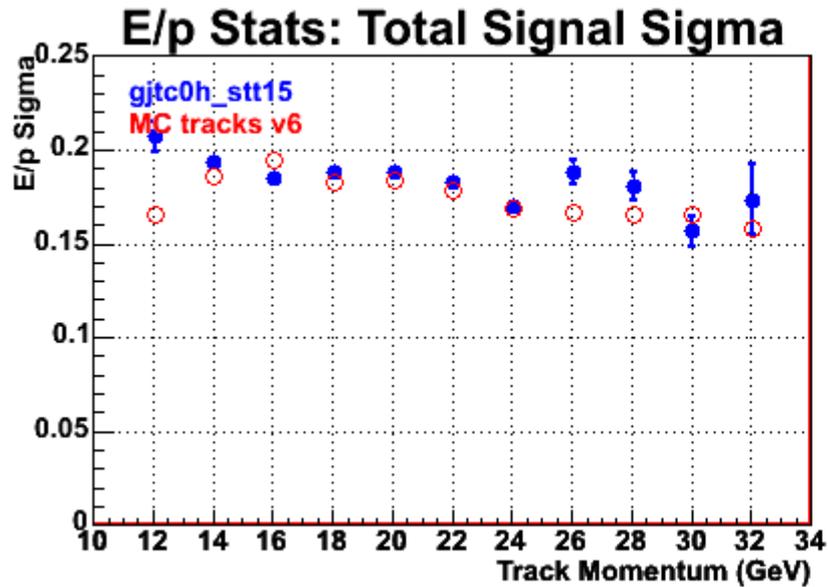
- ▶ MC simulation of fake tracks: pions, kaons, and protons
 - ▶ Generated with development version of cdfSim and Gflash linked against static version 6.1.3pre5
 - ▶ Processed with Production and Stntuple v6.1.2
 - ▶ 500k events generated with each particle
 - ▶ Used a 6:3:1 ratio of pions, kaons, and protons
 - ▶ There is a Pythia Tuna A minimum bias underneath the fake events



Comparison between MCs

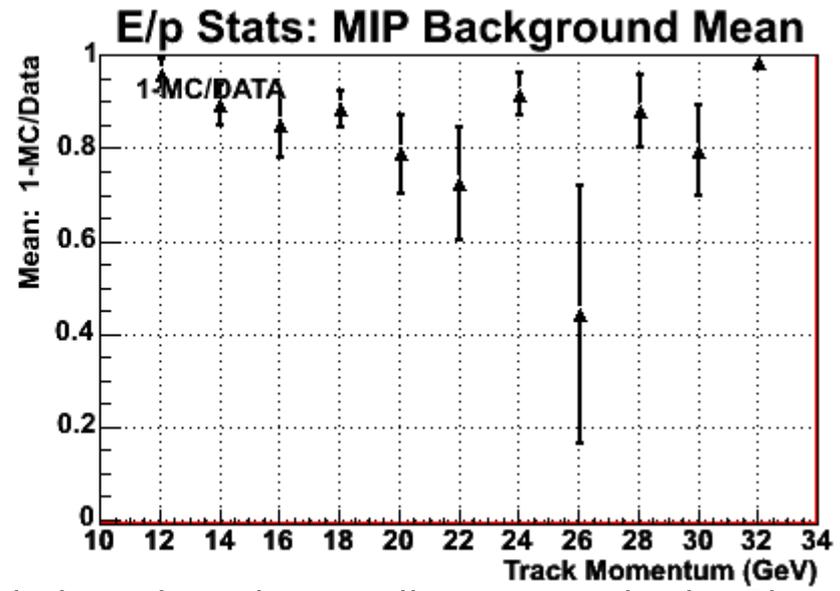
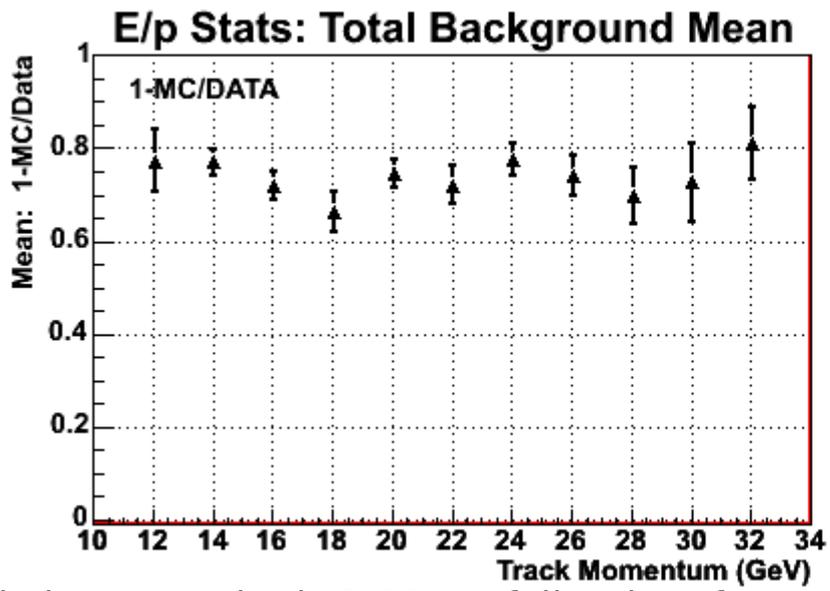
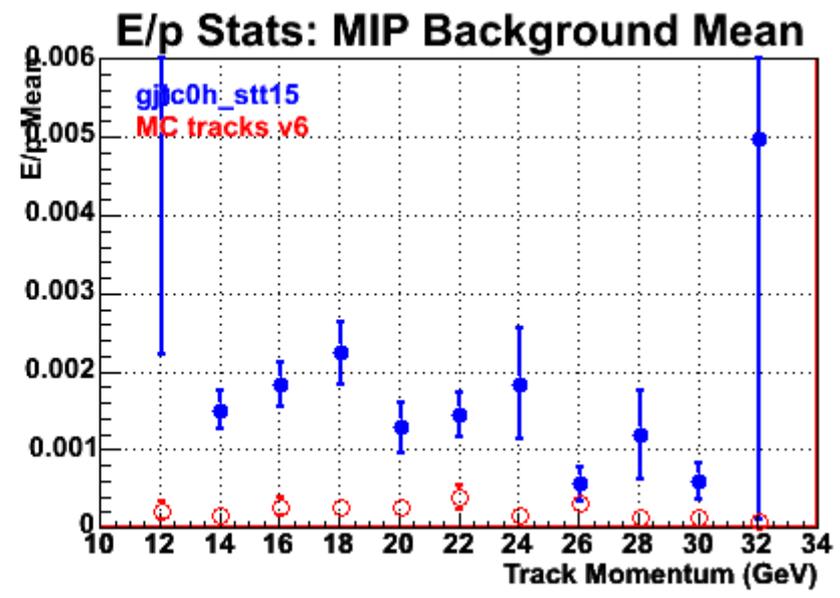
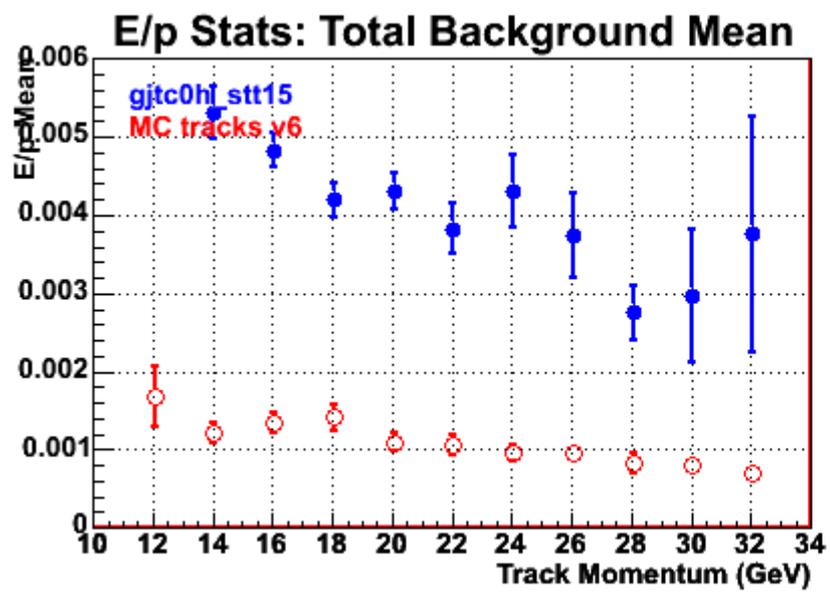








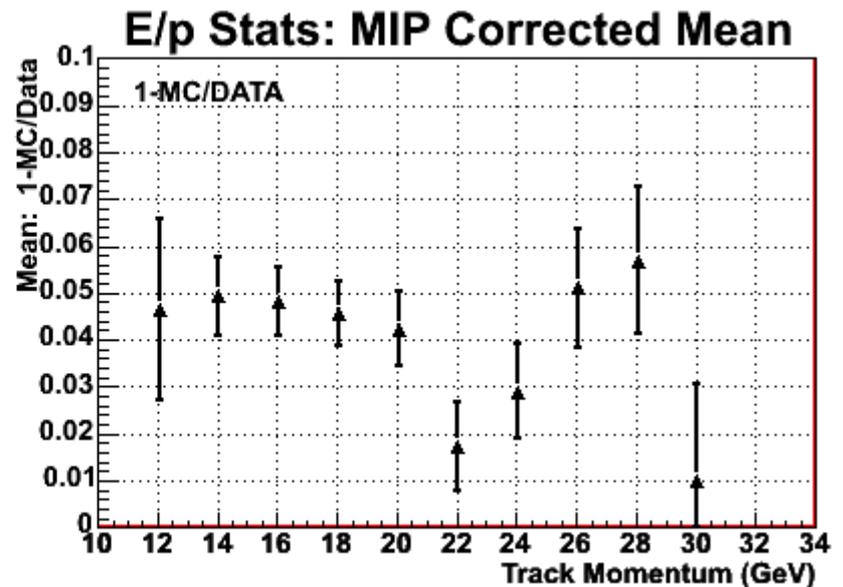
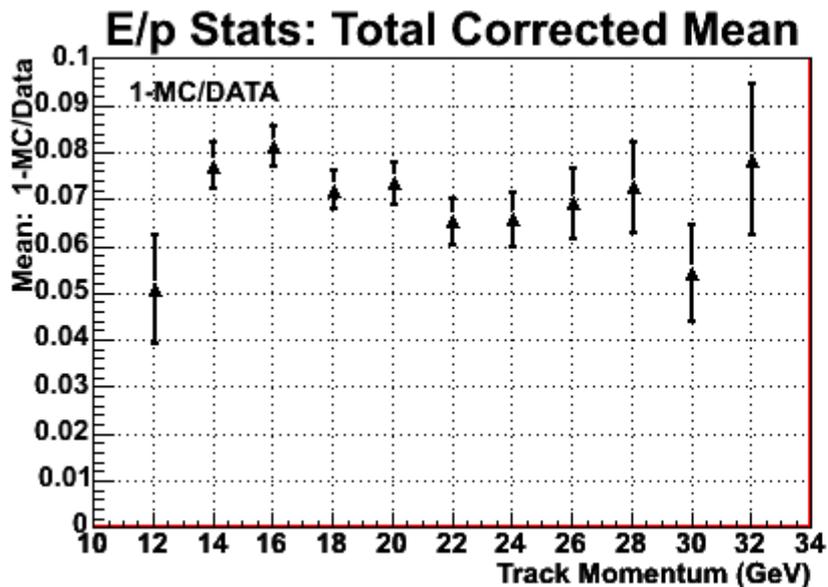
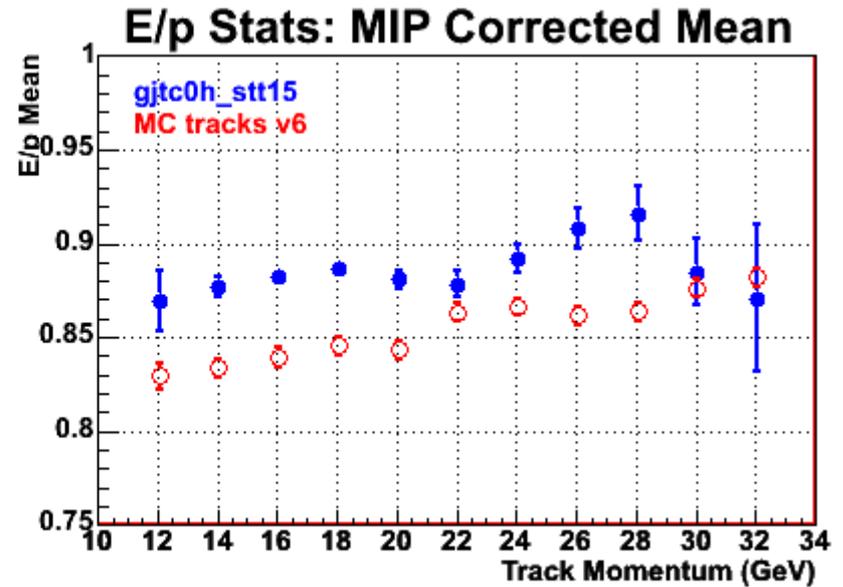
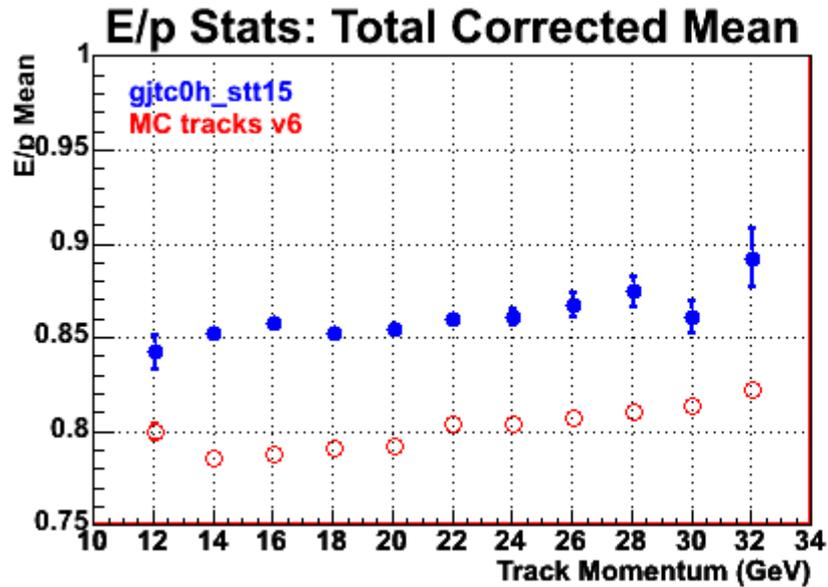
Stt15 data vs MC v6



Note: Scale in upper plot is 0.005, a full order of magnitude less than the 5% discrepancy in the Signal

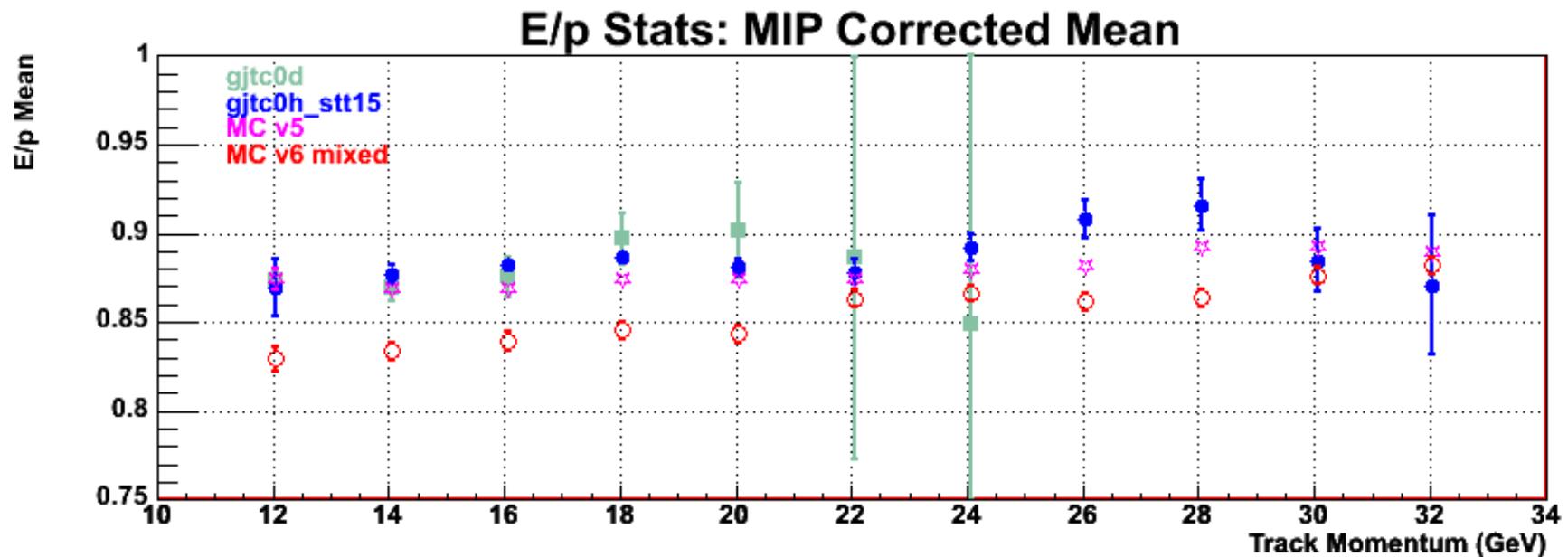
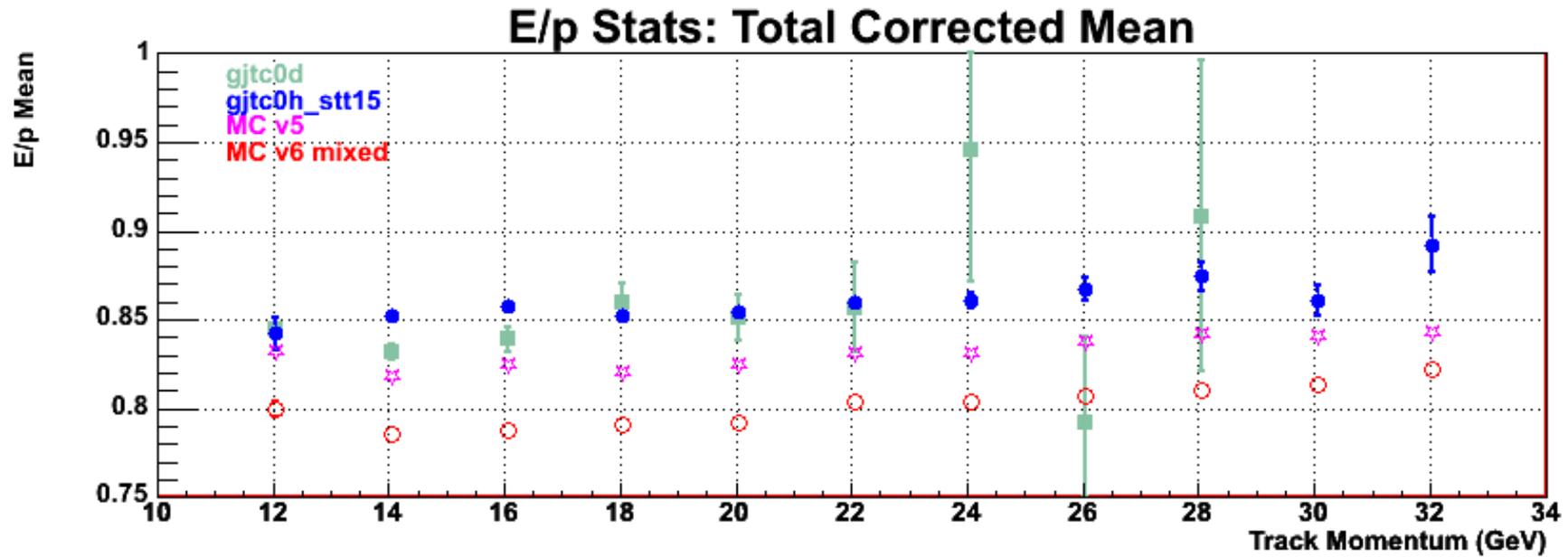


STT15 data vs MC v6

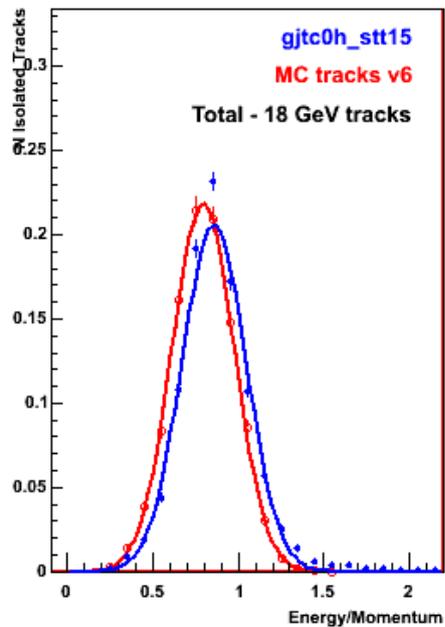




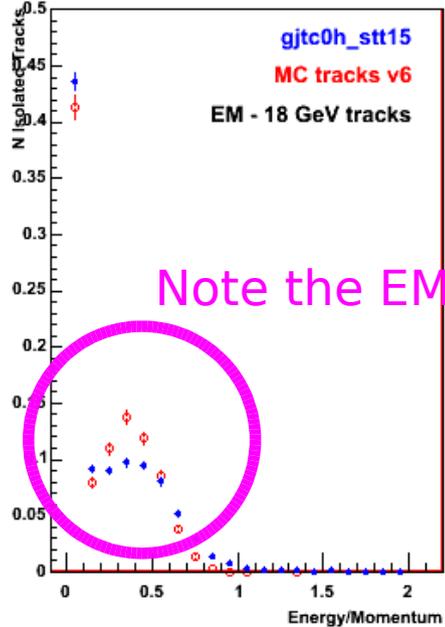
Comparison between data and MCs



E / p : Central Region(s) - 18 GeV - Total Signal

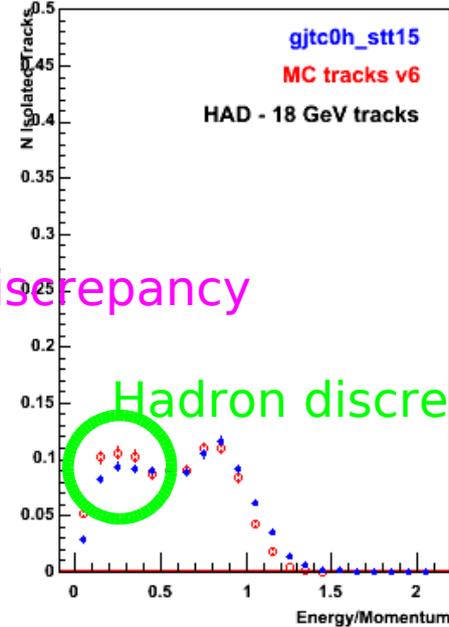


E / p : Central Region(s) - 18 GeV - EM Signal



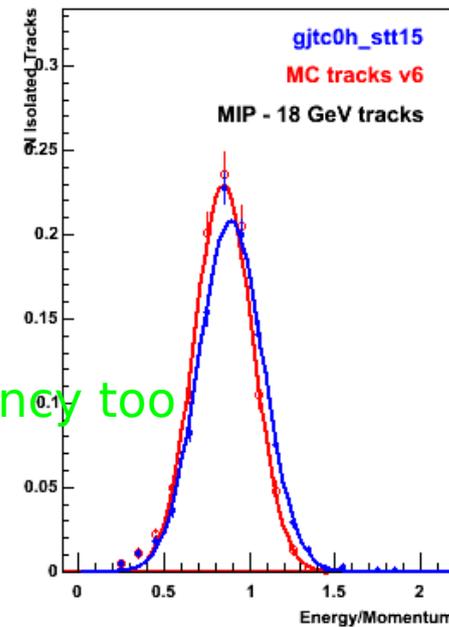
Note the EM discrepancy

E / p : Central Region(s) - 18 GeV - HAD Signal

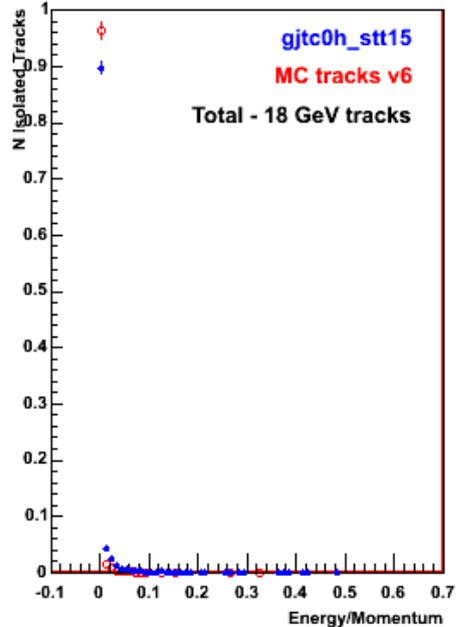


Hadron discrepancy too

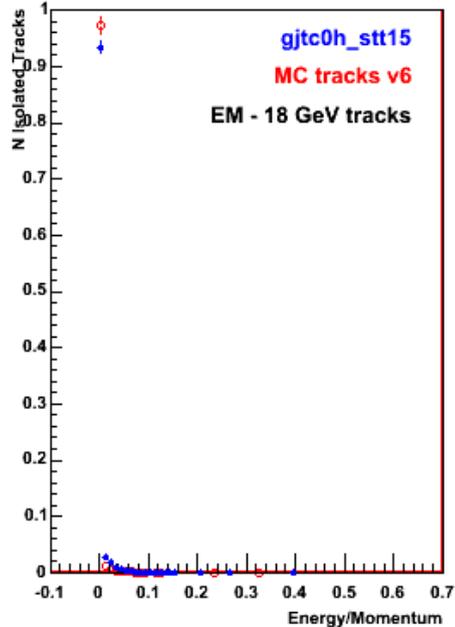
E / p : Central Region(s) - 18 GeV - MIP Signal



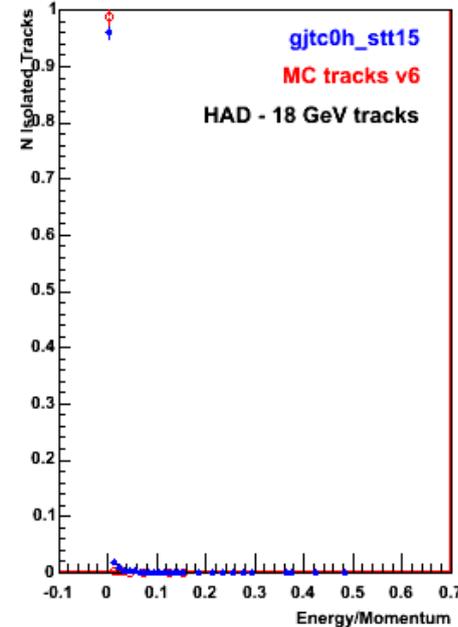
E / p : Central Region(s) - 18 GeV - Total Background



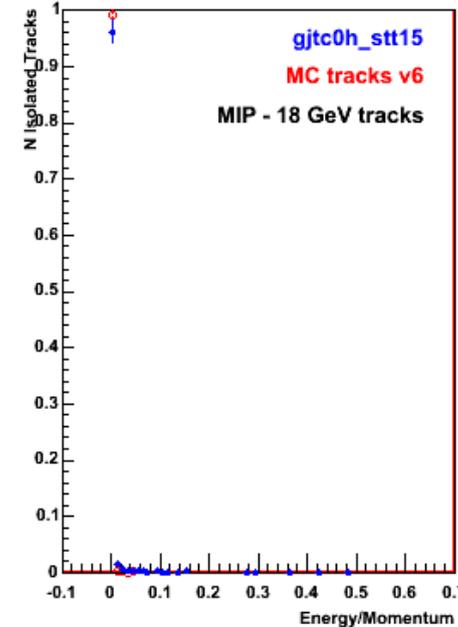
E / p : Central Region(s) - 18 GeV - EM Background



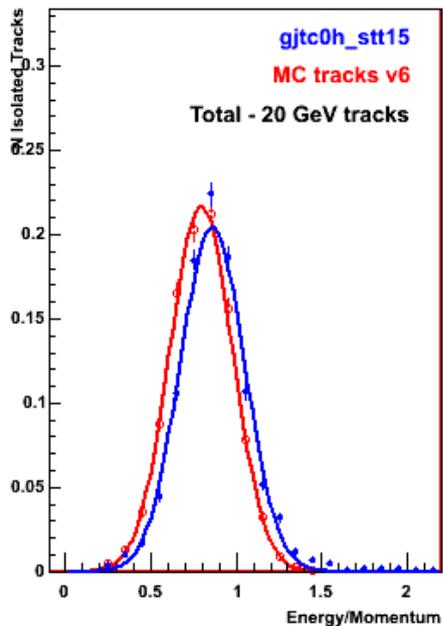
E / p : Central Region(s) - 18 GeV - HAD Background



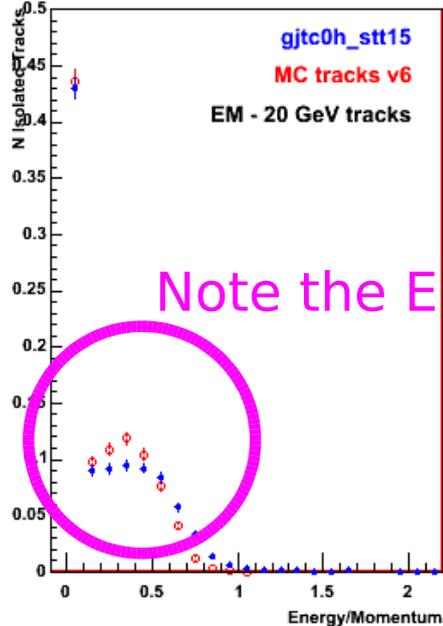
E / p : Central Region(s) - 18 GeV - MIP Background



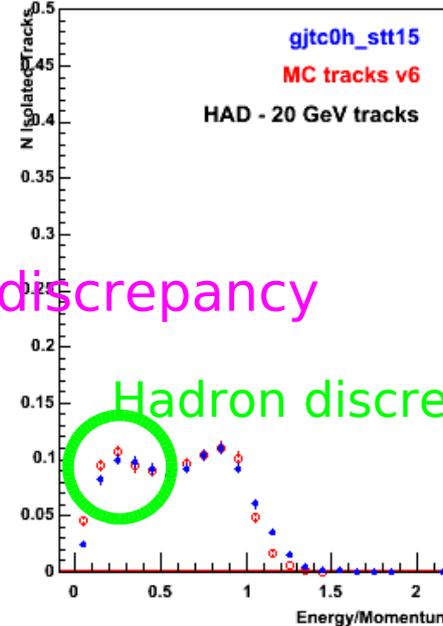
E / p : Central Region(s) - 20 GeV - Total Signal



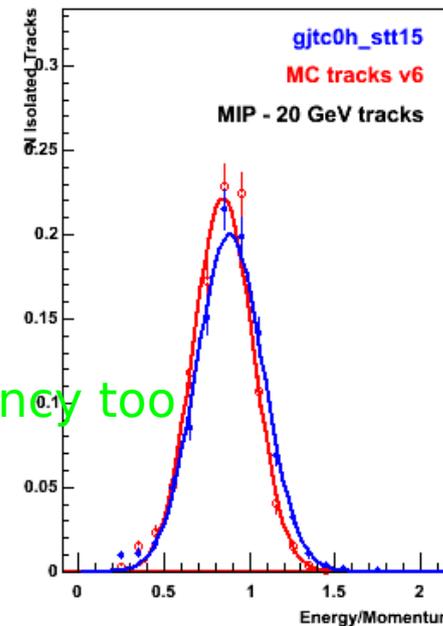
E / p : Central Region(s) - 20 GeV - EM Signal



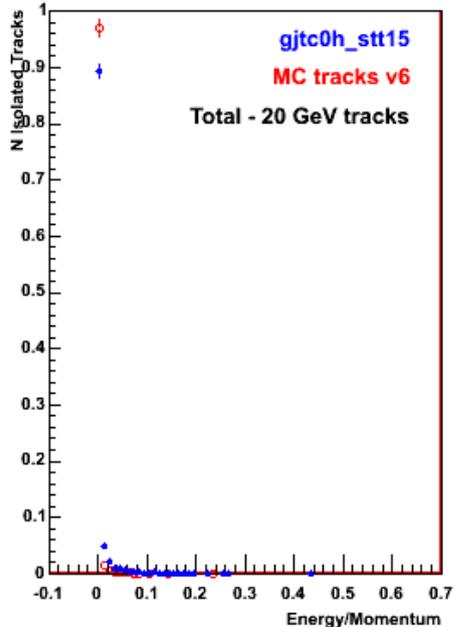
E / p : Central Region(s) - 20 GeV - HAD Signal



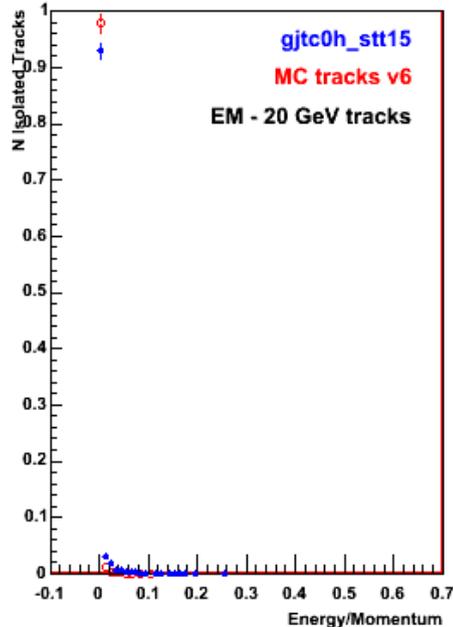
E / p : Central Region(s) - 20 GeV - MIP Signal



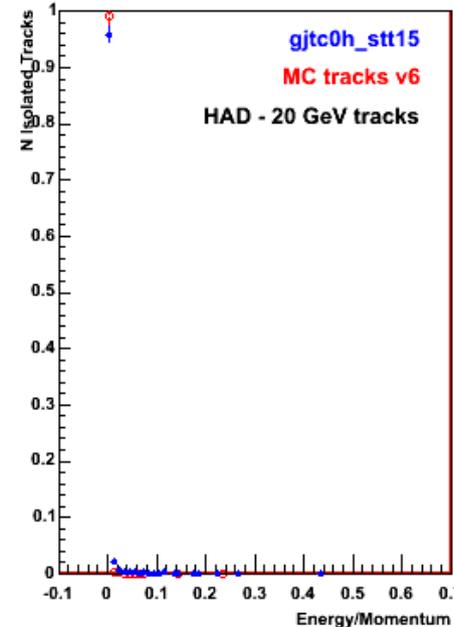
E / p : Central Region(s) - 20 GeV - Total Background



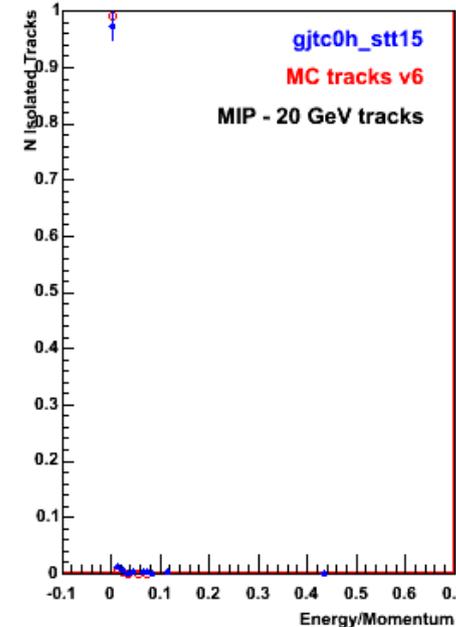
E / p : Central Region(s) - 20 GeV - EM Background



E / p : Central Region(s) - 20 GeV - HAD Background



E / p : Central Region(s) - 20 GeV - MIP Background

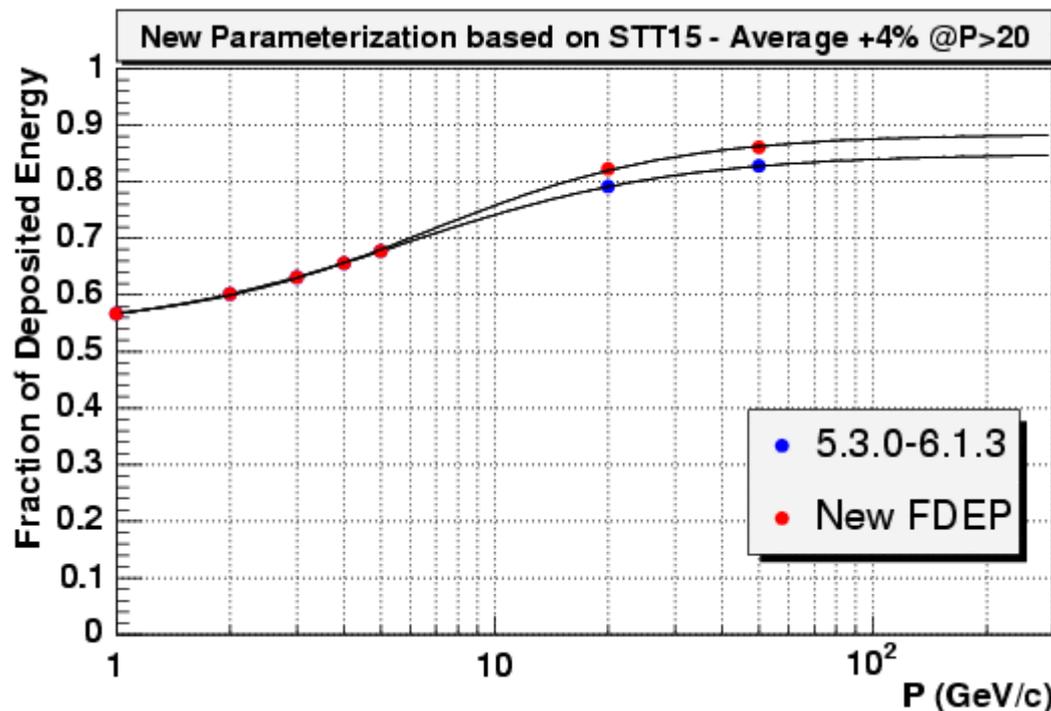




- ▶ In the MC v6/Gflash simulation we see a larger 7% discrepancy between the data and MC in the total signal
 - ▶ Larger discrepancy than what we saw in the gen5 MC
 - ▶ Roughly break down as 4% in the MIP signal -> 4% global correction
 - ▶ Another 4% -> in the EM to adjust for the EM sampling fraction



Gflash Parameterization



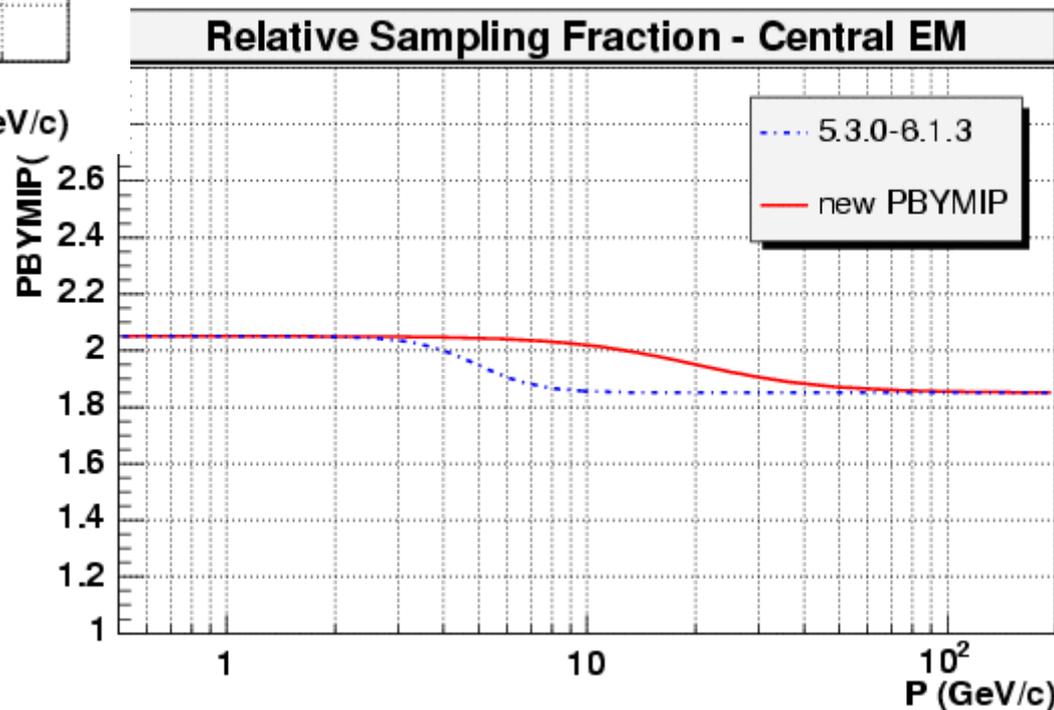
In both histograms:

- blue current Gflash param.
- red new Gflash param.

Upper Left - “Hadron tuning” is based on the 4% discrepancy in the MIP signal

Lower right - “EM tuning” an additional EM discrepancy at high p - Adjusted for with the new curve

Please note this is a trial parameterization



- ▶ Regenerate fake events
 - ▶ Use the newest Gflash lateral tuning
 - ▶ Same as above but include the preliminary tuning based on this study
- ▶ We want to study the correlated background from the contribution of neutral particles.
 - ▶ One way it to study dijet Monte Carlo and look at the neutral correlated background.
 - ▶ But statistics limited - the Isolation cuts on this study will limit any single tracks
- ▶ Current CES Isolation is no clusters in a 7x7 block outside a cone of $\Delta R=0.03$ around the target track
 - ▶ See how the CES Isolation affects the neutral background
 - ▶ Loosen CES isolation cut and see if the background is correlated to the track
 - ▶ i.e. Low energy neutral jet fragments