Full Momentum Spectrum of E/p Results

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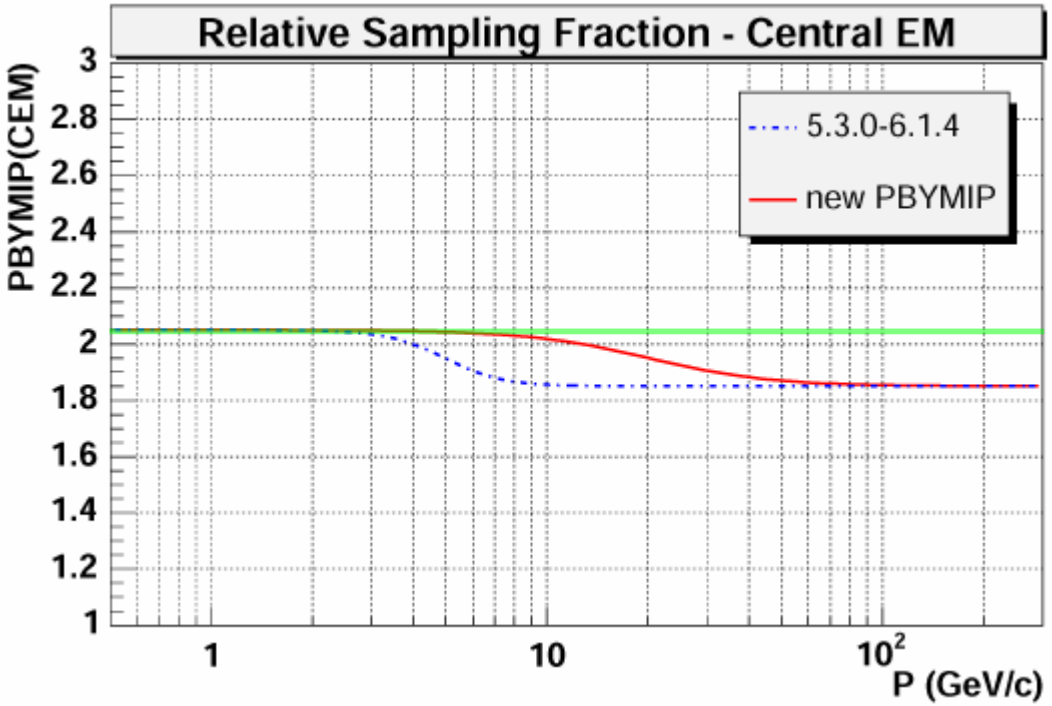
Introduction & Outline

- New Monte Carlo(MC) sample generated
  - “MCv6 D” - changes made from previous MC iteration
- Datasets
  - Full Momentum spectrum
- Changes made to accommodate the full momentum spectrum
  - Removing the muon veto
  - How the E/p mean is extracted
- Comparisons between data and MC

MC Sample

- MCv6 D
  - Changed the EM Relative Sampling Fraction based on MCv6 C
  - Value of the Green line below is from our data vs. MCv6 C results.
  - 1,000,000 fake events generated with 6.1.4_int1, processed with Stntuple 6.1.2
  - Pythia Tune A minimum bias added as an underlying event
  - Pions, Kaons, and protons generated in a 6:3:1 ratio
  - flat momentum spectrum from 0 to 42 GeV/c

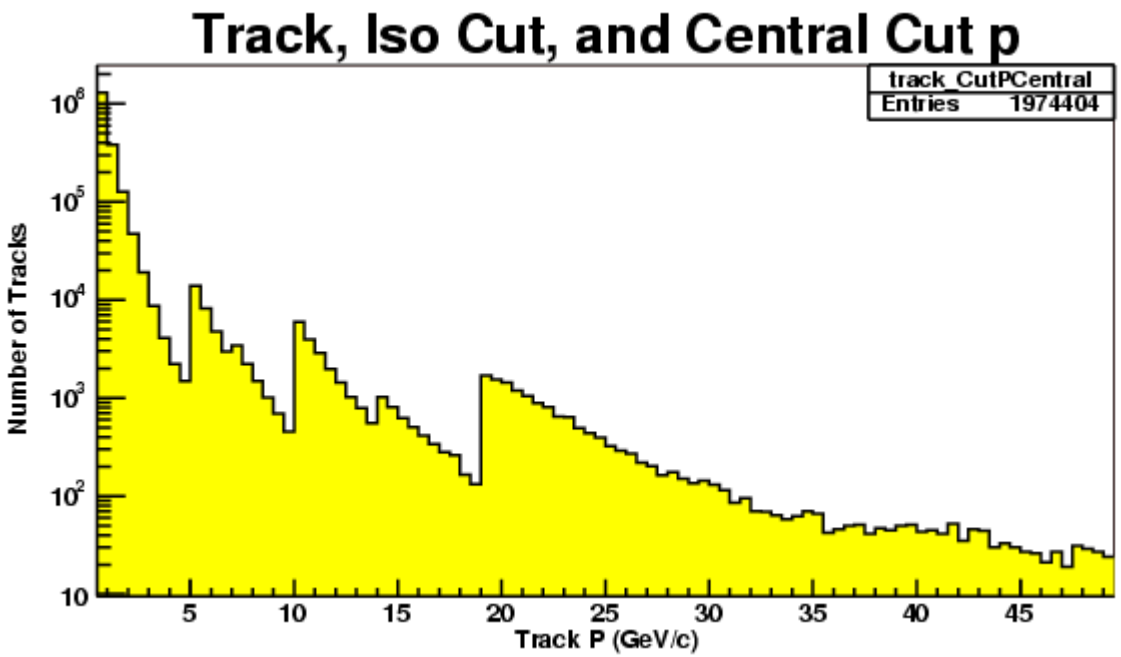


Full Spectrum Datasets

- I compared the MC to four/five different datasets
  - gjtc0h_stt15 15 GeV Single Track Trigger (15 STT)
  - gjtc0h_stt10 10 GeV Single Track Trigger (10 STT)
  - gjtc0d + gjtc01 Jet Calibration Data
  - gmbs0d Minimum Bias Data
- 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

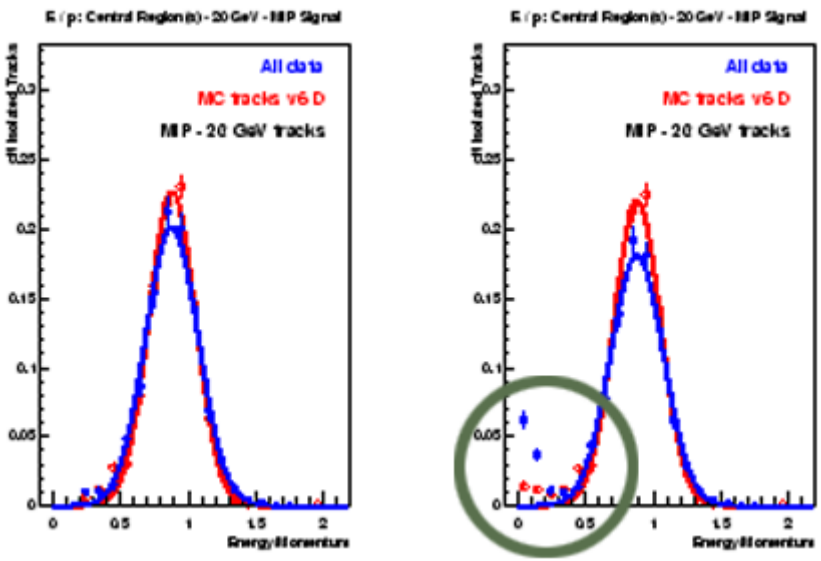
Combined Dataset

- Combined all data into one large sample.
- In doing so introduced logic to select tracks away from the trigger thresholds.
  - e.g. for the 10 GeV/c trigger threshold we demanded the target tracks had greater than 14 GeV/c.
  - Although this lowers our total statistics it helps create a “cleaner” sample of good data for the full range of momentum, 0 to 38 GeV/c.

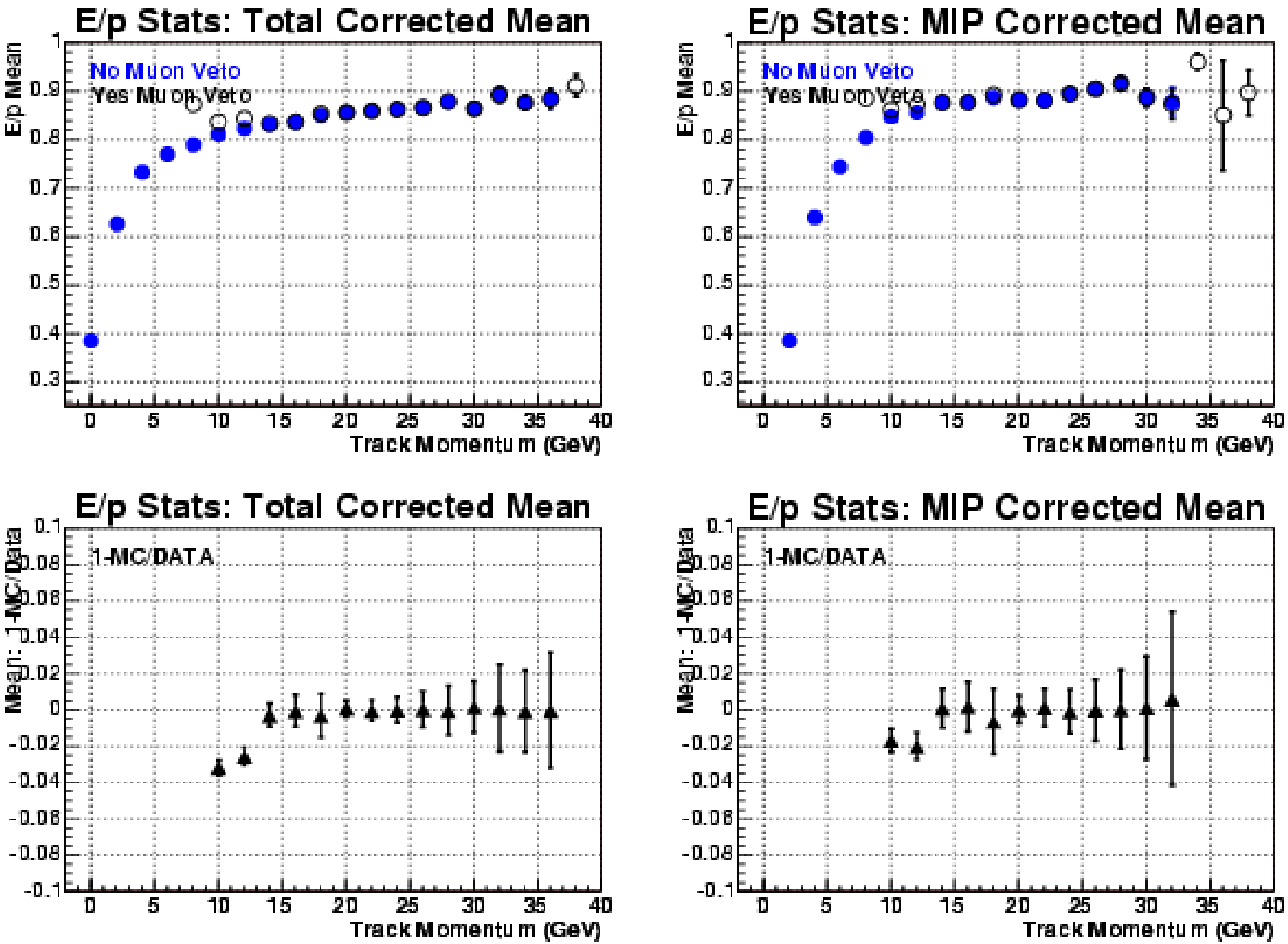


Changes to Analysis

- Muon veto removed
  - Previously we had a Energy requirement that E > 5 GeV in order to cut muons from our sample of isolated tracks.
  - For the low momentum response E/p this cut needed to be removed.
  - At high momentum the difference should be small because we use converging Gaussian fits which ignore the tails of the distribution.
- Left: muon veto included Right: no muon veto



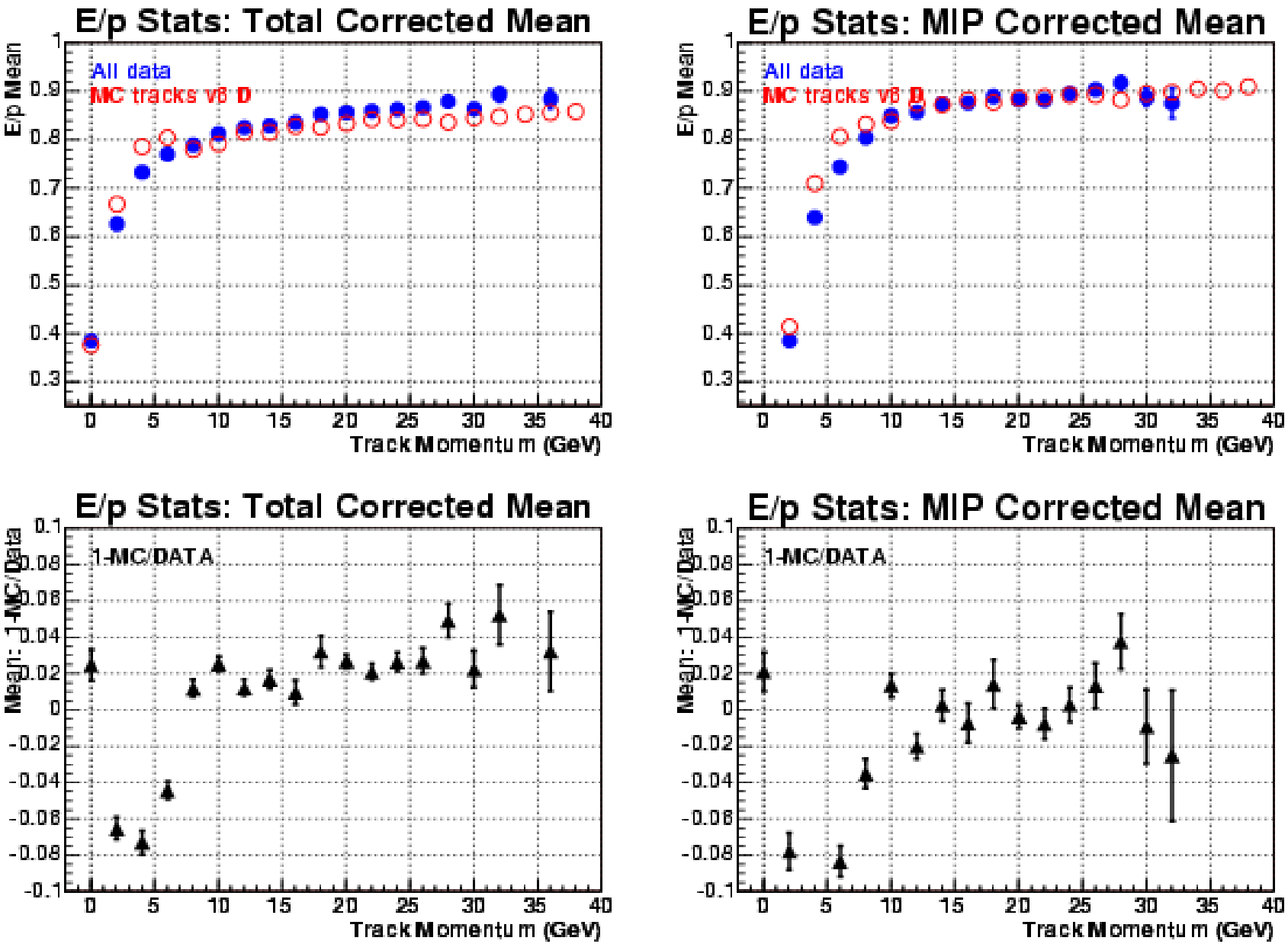
Muon veto comparison



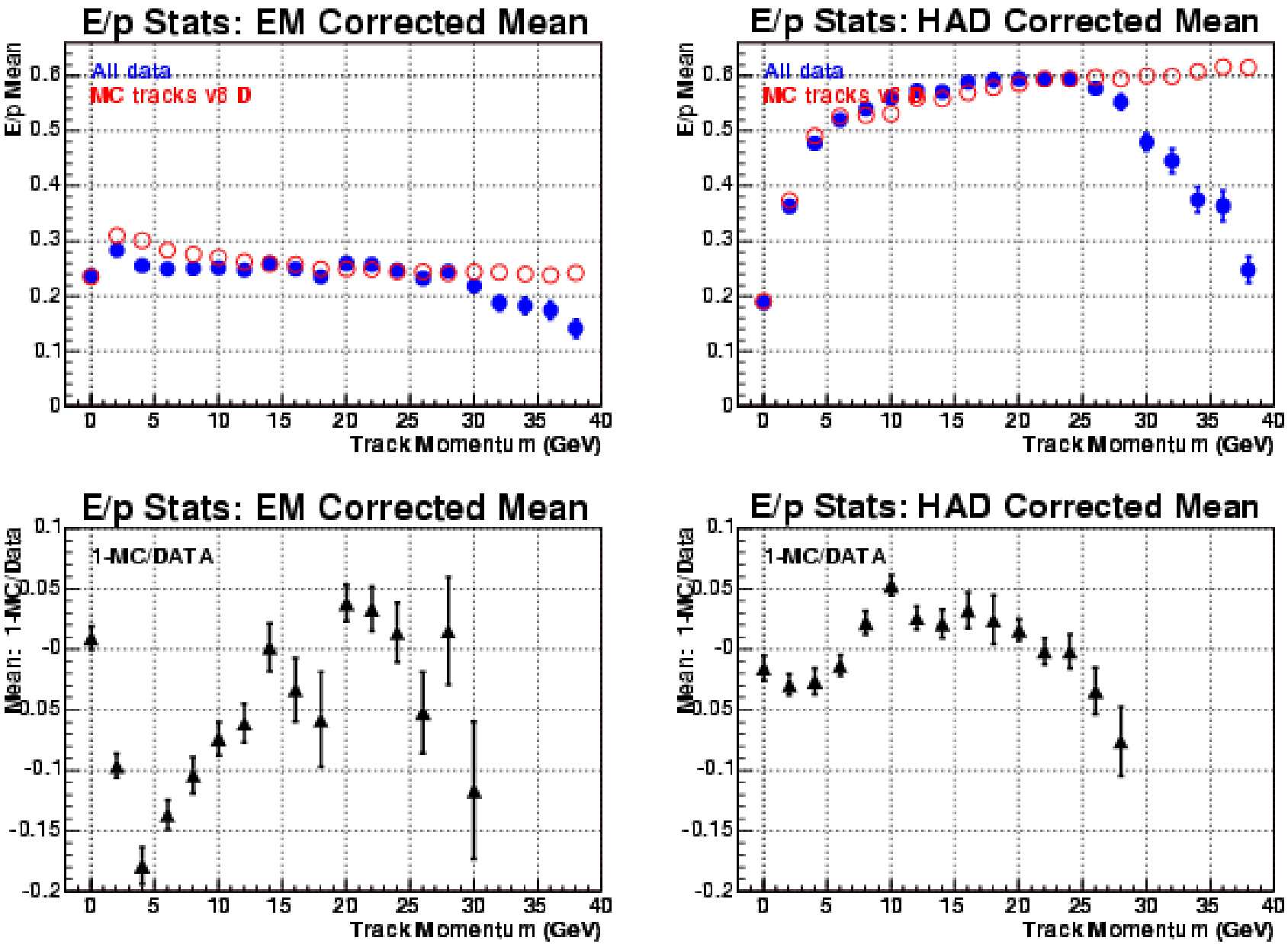
Additional Changes

- Only use Gaussian Fit on data with p >= 8 GeV
  - Don't use the Gaussian mean and sigma for the E/p comparisons because the E/p results at low momentum is not as well defined.
  - Instead use the mean of the histogram for the E/p signal.

Full Spectrum: Total and MIP



Full Spectrum: EM and HAD



Conclusions

- While the high momentum E/p results look pretty good, the results at low momentum have changed.
- Another iteration of MC (MCv6 E) is currently being generated/processed.
  - Increase 2% in the fraction of π^0 production above 20 GeV/c to try to tune the E/p at high momentum.
  - Setting the Rel. Sampling Fraction back to 1.85 (the old default value) to understand the -8% difference in the E/p below 5 GeV/c.