Improvements for the Gen-7 Plug Tuning

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Simulation Group Meeting

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Overview

- Current GFLASH parametrization for the Plug has a discontinuity at p~20GeV/c where f6 tuning changes to old Gen-5 tuning.

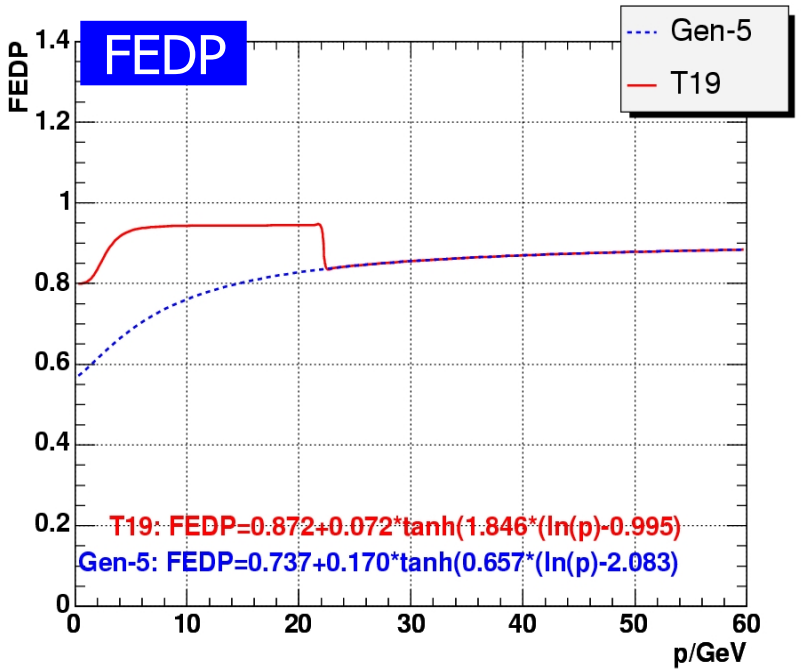
  - Fractional energy deposit: FEDP: ~0.94 → ~0.84 (Gflash/GflashSim/gfinha.F)
  - Relative sampling fractions: PBYMIP(1): 0.87 → 1.82
    PBYMIP(2): 1.28 → 3.20 (Gflash/GflashSim/gfshow.F)
  - Also scaling factors for tower 10/11 sampling fractions have a step.

- However, the effect of the above to simulated E/p response is not too drastic because of the opposite trends of the parameters. But these mutual cancellation is not perfect.

This talk: Proposal for a new parametrization:

- Ensures perfectly smooth transition f6 ® Gen-5.
- Provides (as a side effect) better agreement with data at 10-20GeV/c.

Current f6 Parametrization

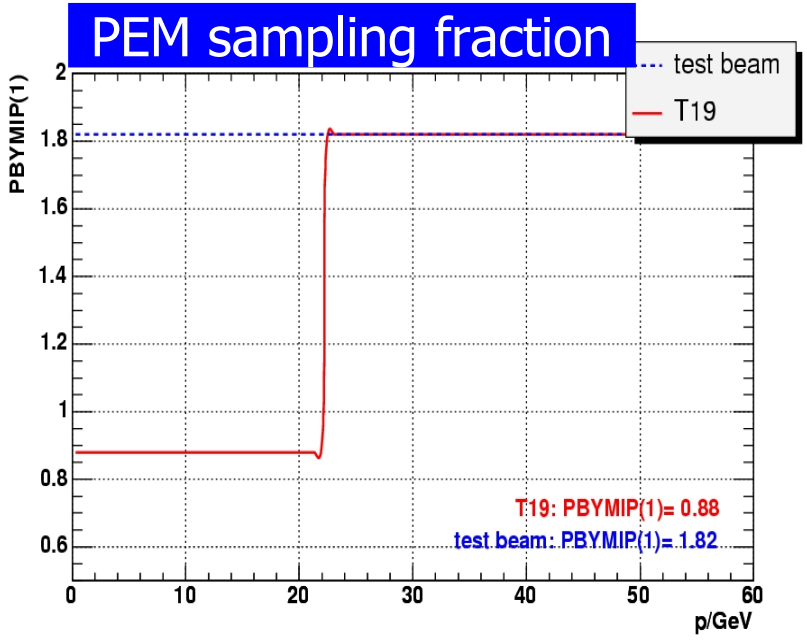


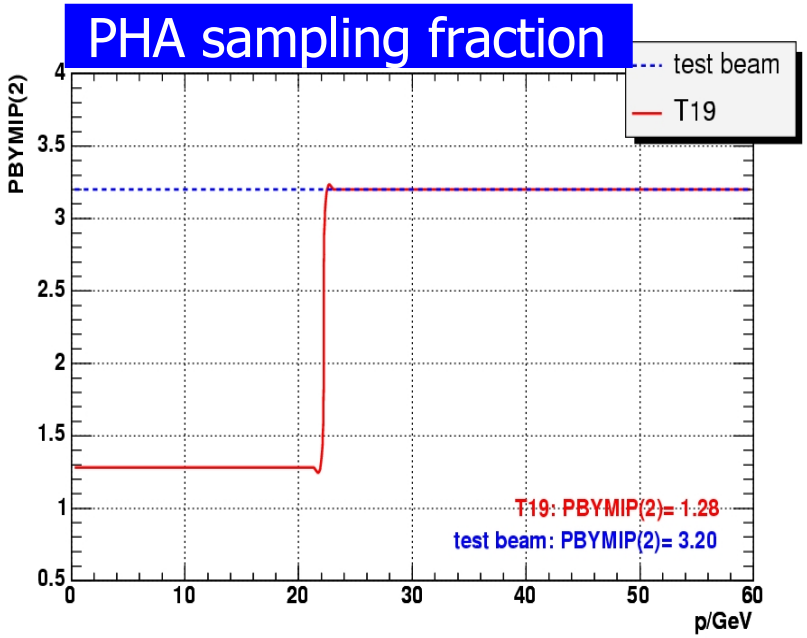
p<20GeV/c :

$FEDP = c_1 + c_2 * \tanh(c_3 * (\log(p) - c_4))$

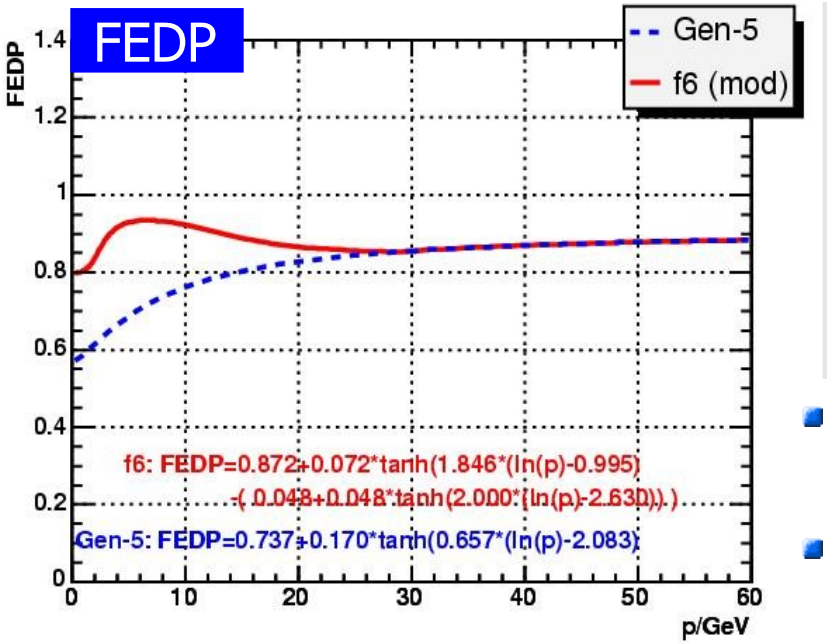
$PEM = k_1$

$PHA = k_1$





Updated f6 Parametrization



p<30GeV/c :

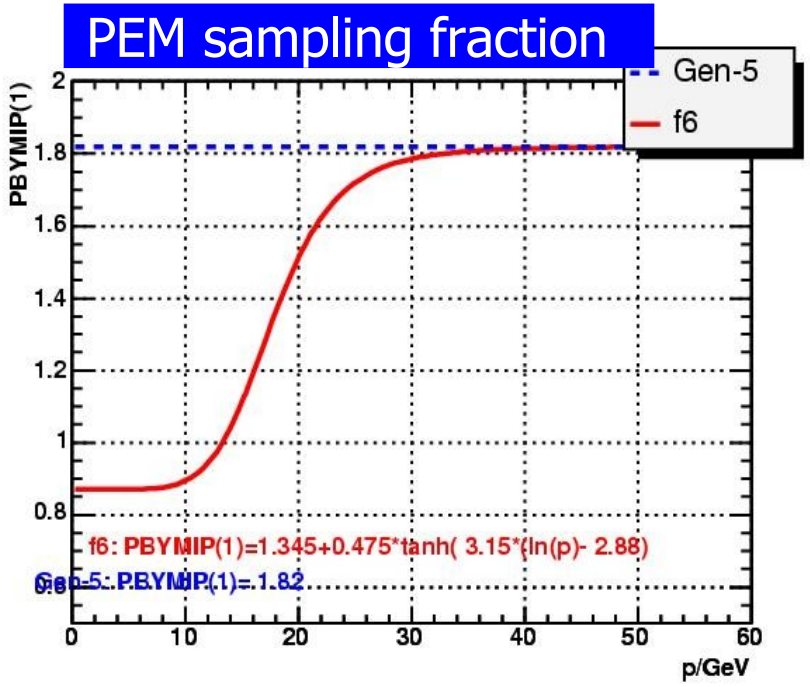
smoothing term

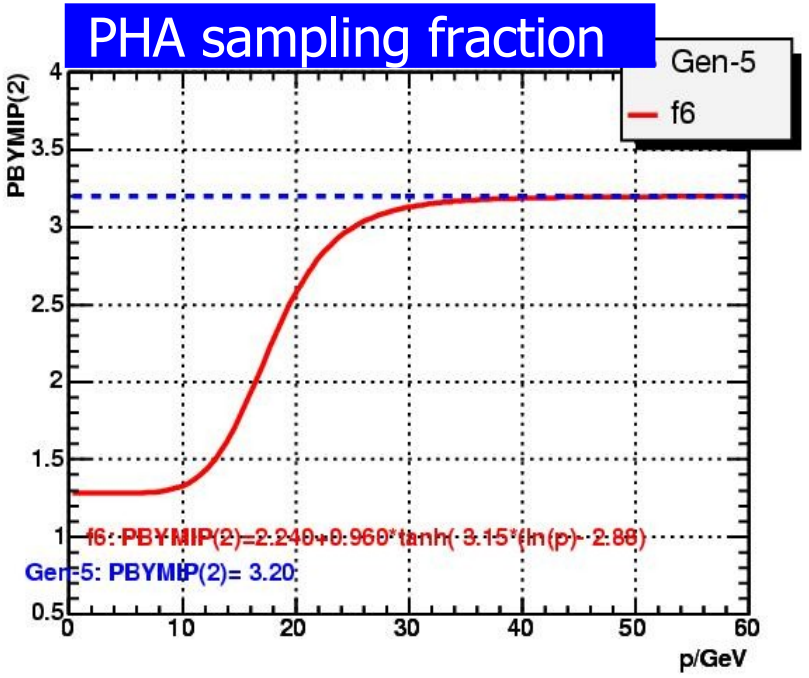
$FEDP = c_1 + c_2 * \tanh(c_3 * (\log(p) - c_4)) - \{c_5 + c_6 * \tanh(c_7 * (\log(p) - c_8))\}$

$PEM = d_1 + d_2 * \tanh(d_3 * (\log(p) - d_4))$

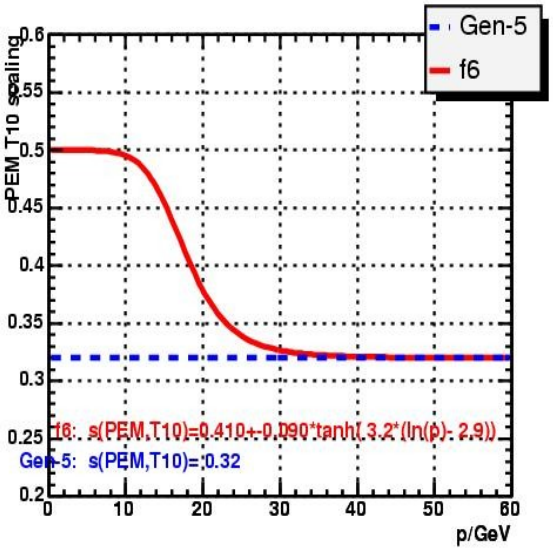
$PHA = e_1 + e_2 * \tanh(e_3 * (\log(p) - e_4))$

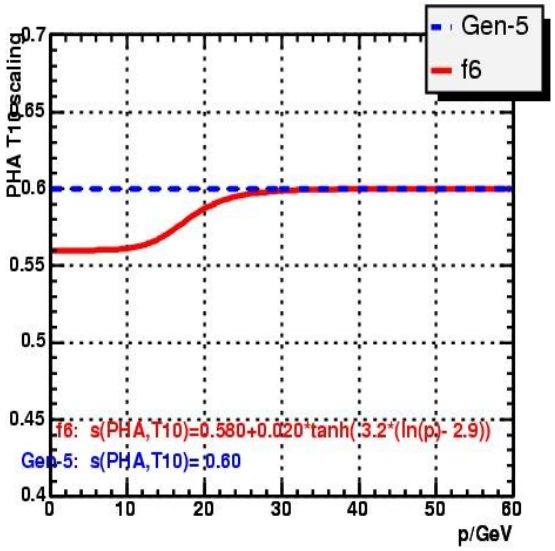
- FEDP: f6 unchanged at low p, smooth decrease to Gen-5 value starting at ~ 8GeV/c
- PHA, PEM sampling: connect f6 with Gen-5 plateau using tanh-function

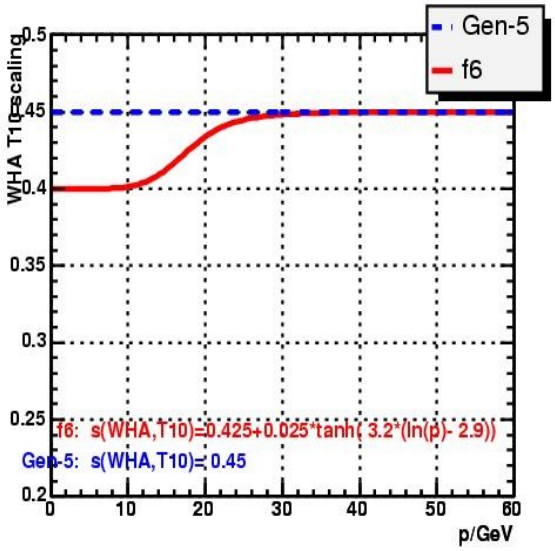


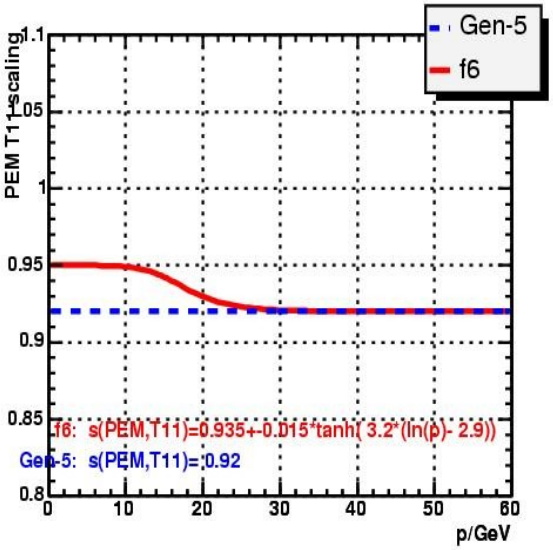


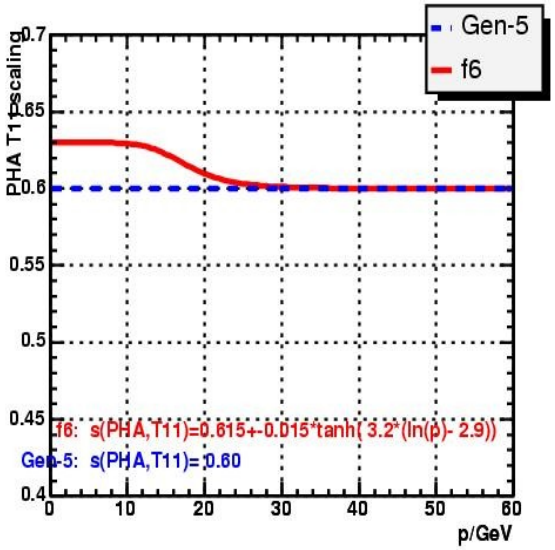
Tower 10/11 Scaling Factors

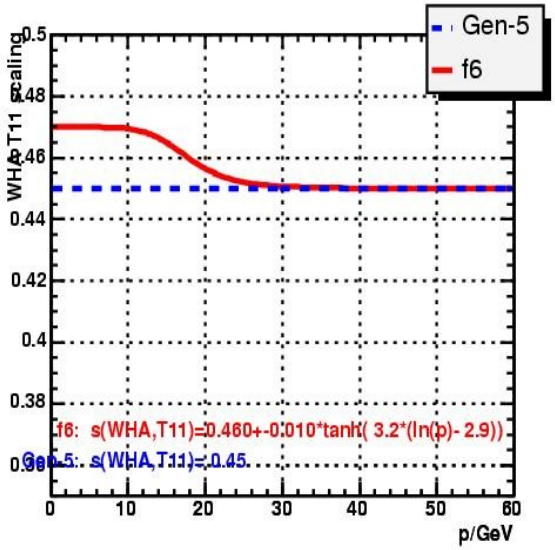








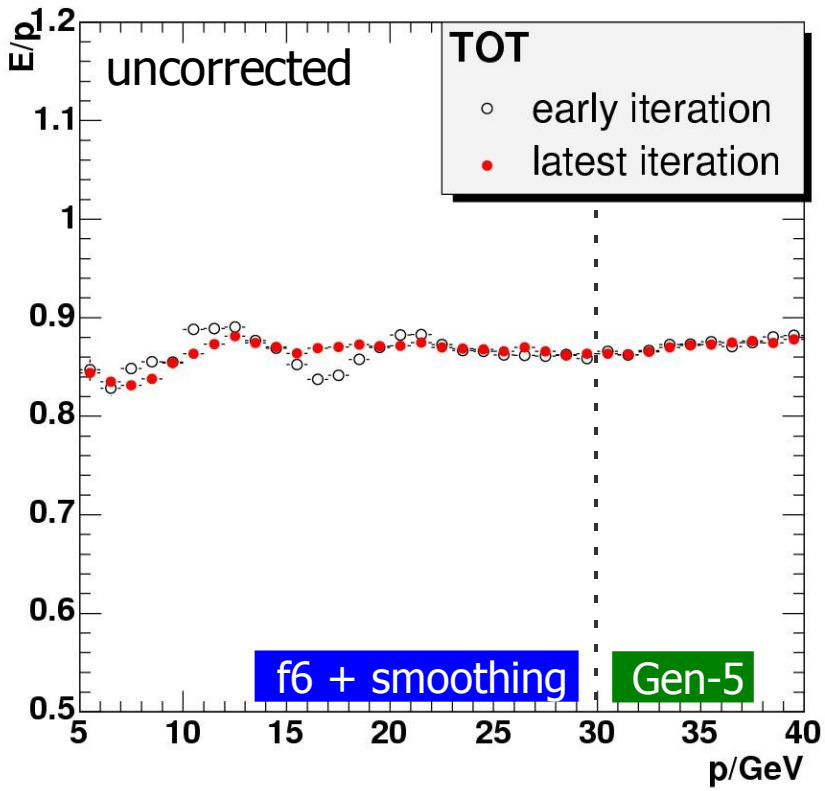


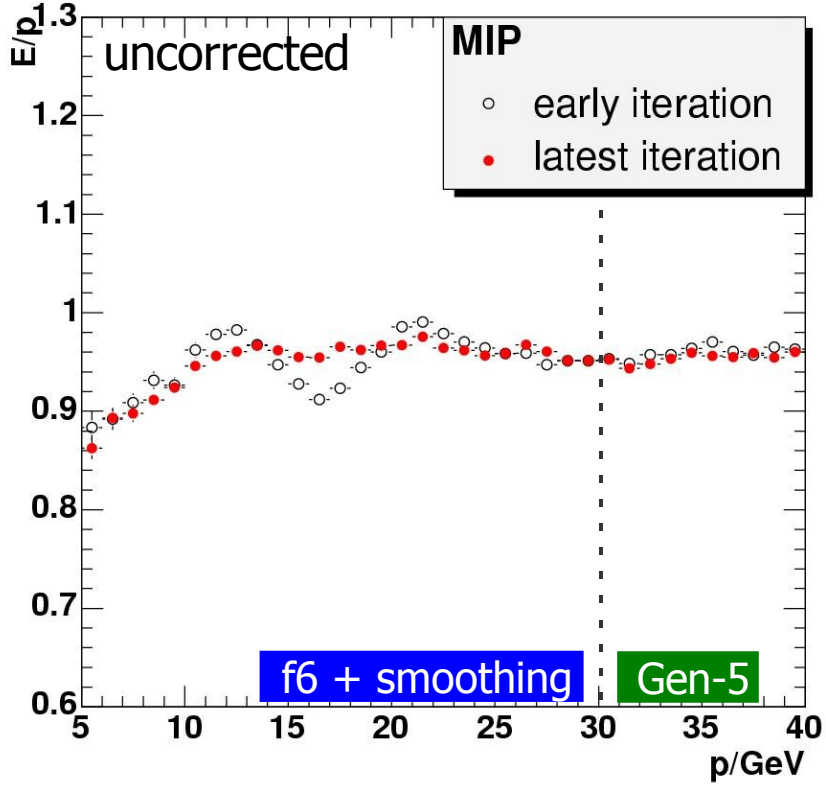


- Use tanh-function to connect f6 and Gen-5 plateaus.

E/p Continuity Test (1)

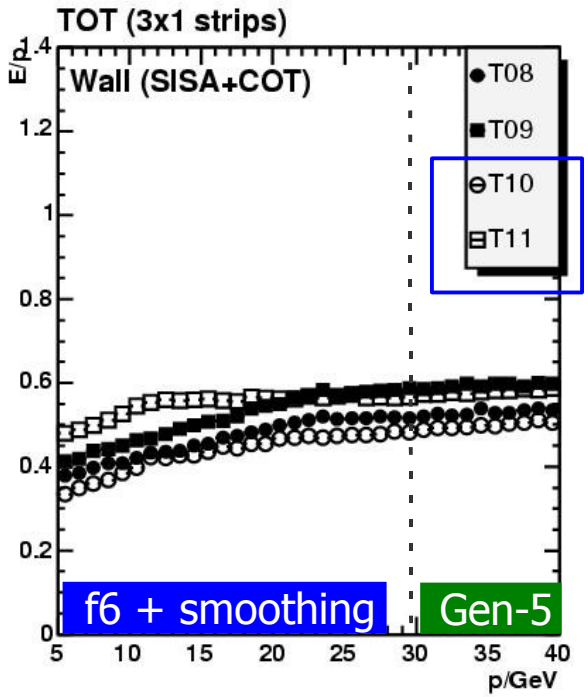
- E/p response using flat FAKEEV spectrum from 0-50GeV/c.

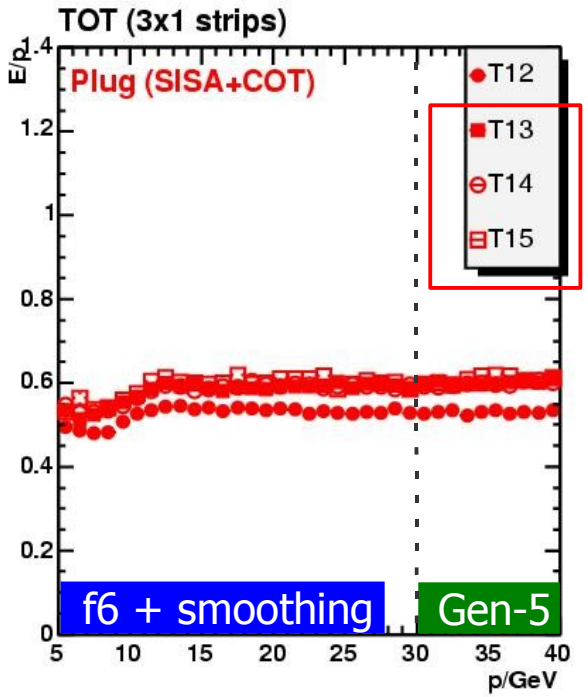


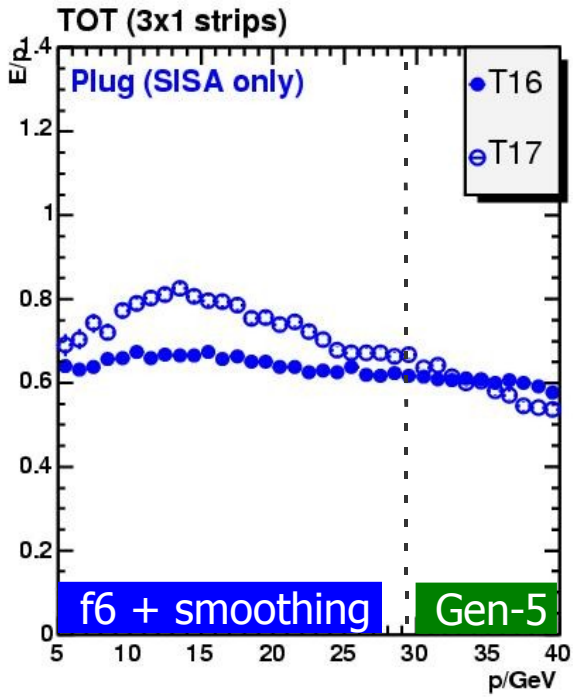


- Continuous transition from f6 to Gen-5.
- Careful mutual adjustment of FEDP and relative sampling fractions necessary to avoid fluctuations (non-trivial task).
- Latest smoothing (red points) gives reasonably constant TOT/p response (~1-2%) in transition region between 10-30 GeV/c.

E/p Continuity Test (2)

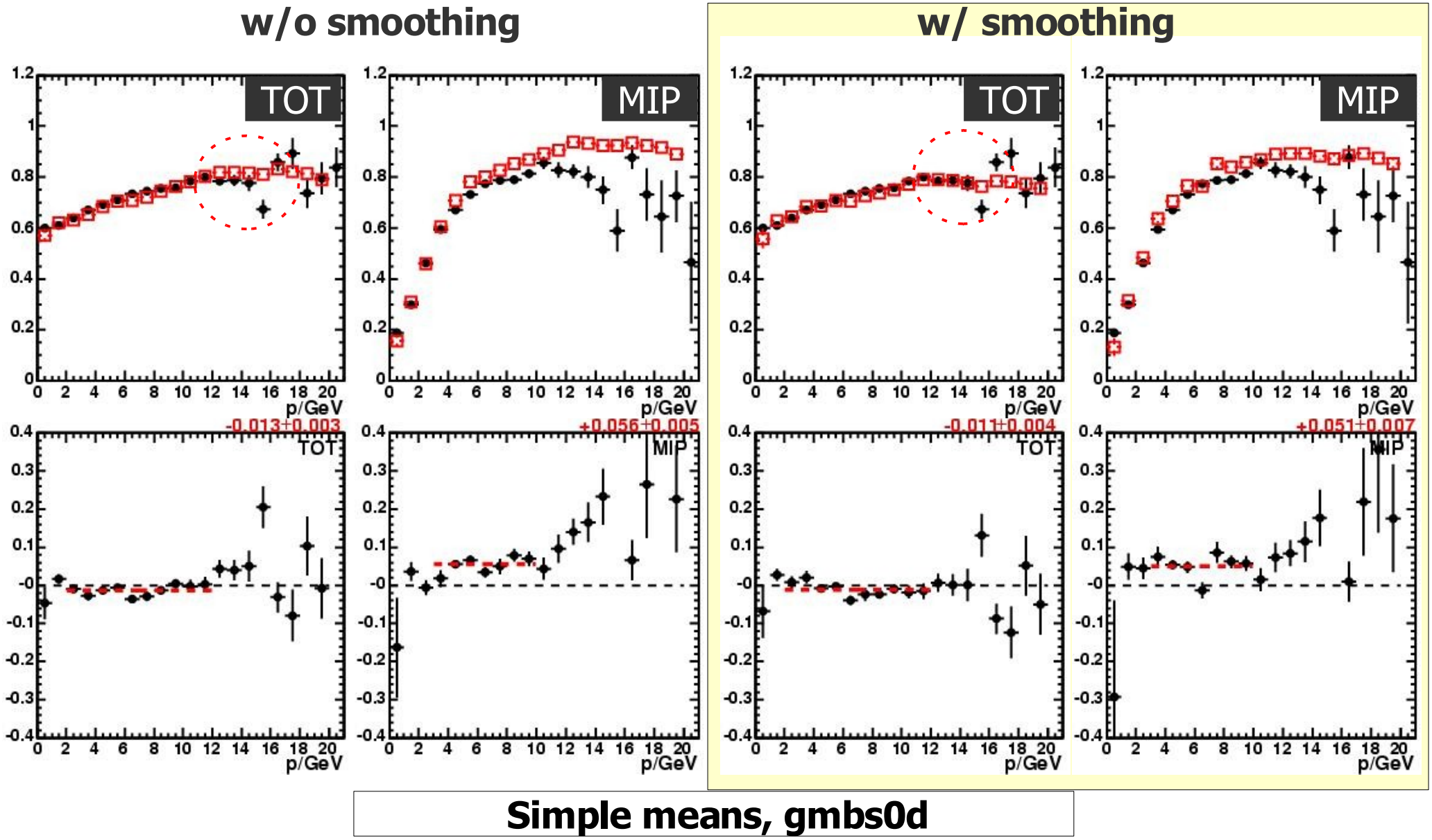






- Above: Uncorrected 3x1 block responses of individual towers in Wall/Plug.
- Continuity of response in crack towers 10+11 after smoothing of scaling factors.
- Note that slope depends on particle spectrum and momentum resolution (decreasing track quality with rising tower numbers).

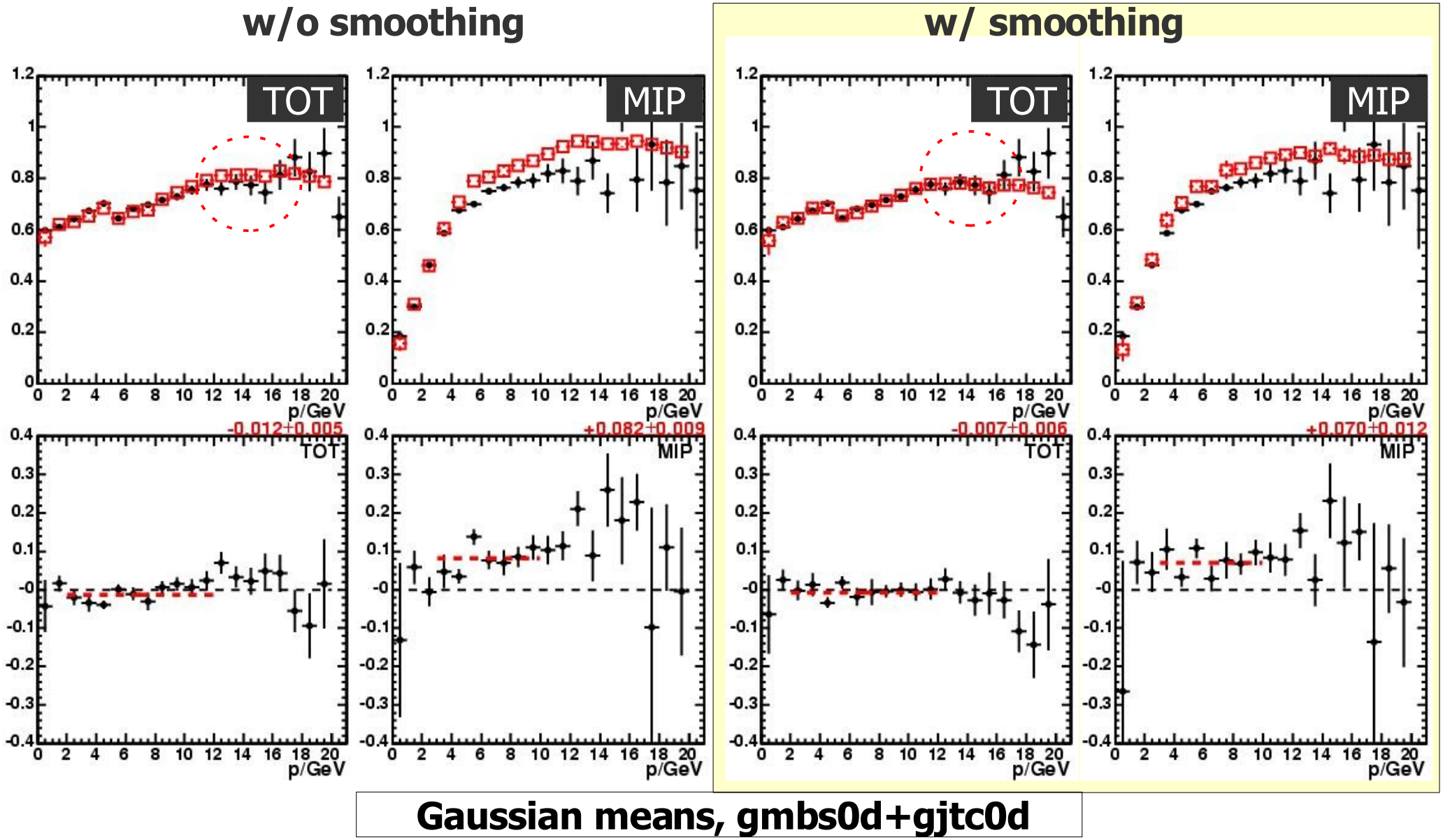
f6 vs. Data (**Plug**)



Simple means, gmbs0d

- Better description of data at p>10GeV/c.

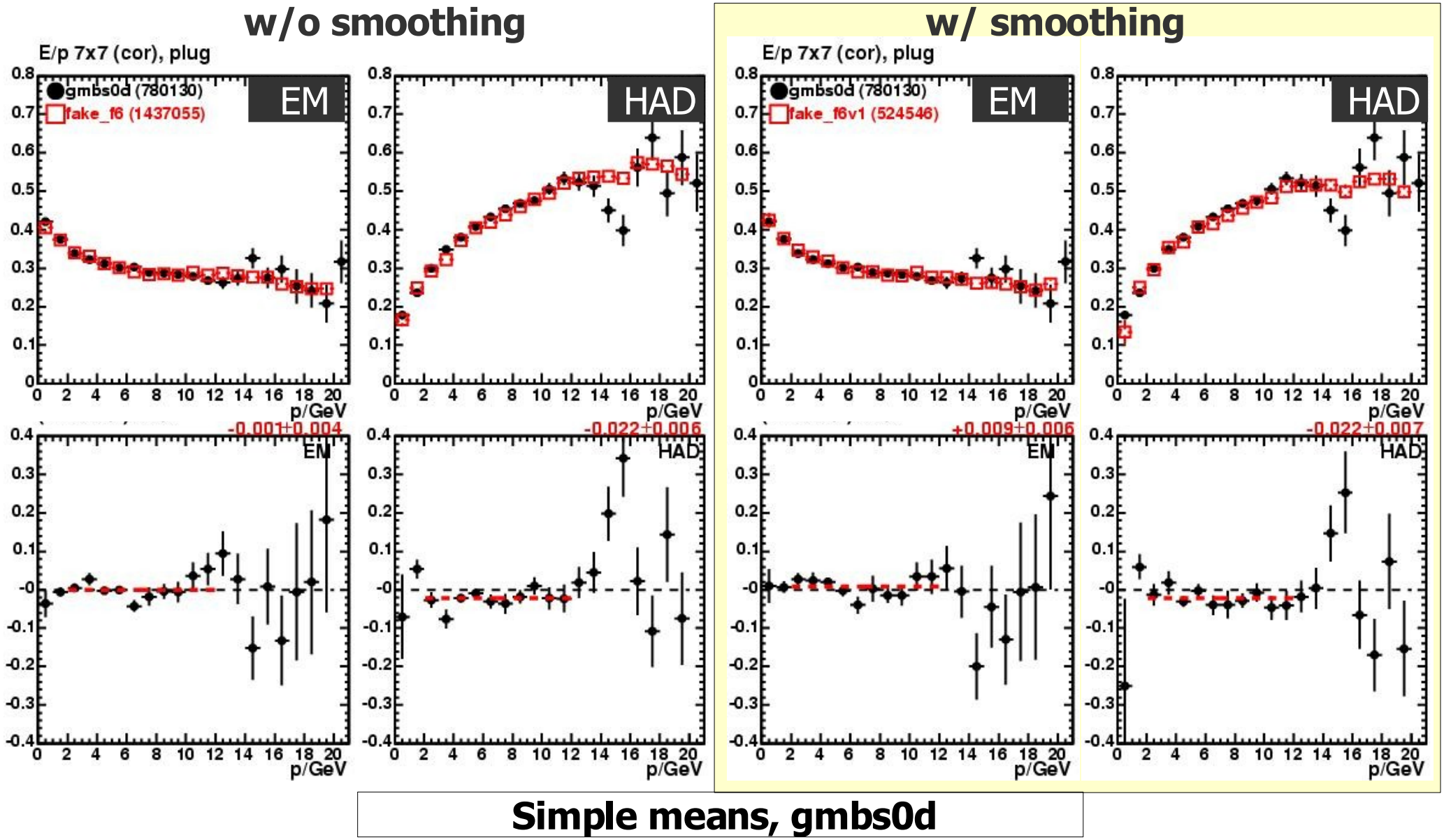
f6 vs. Data (**Plug**)



Gaussian means, gmbs0d+gjtc0d

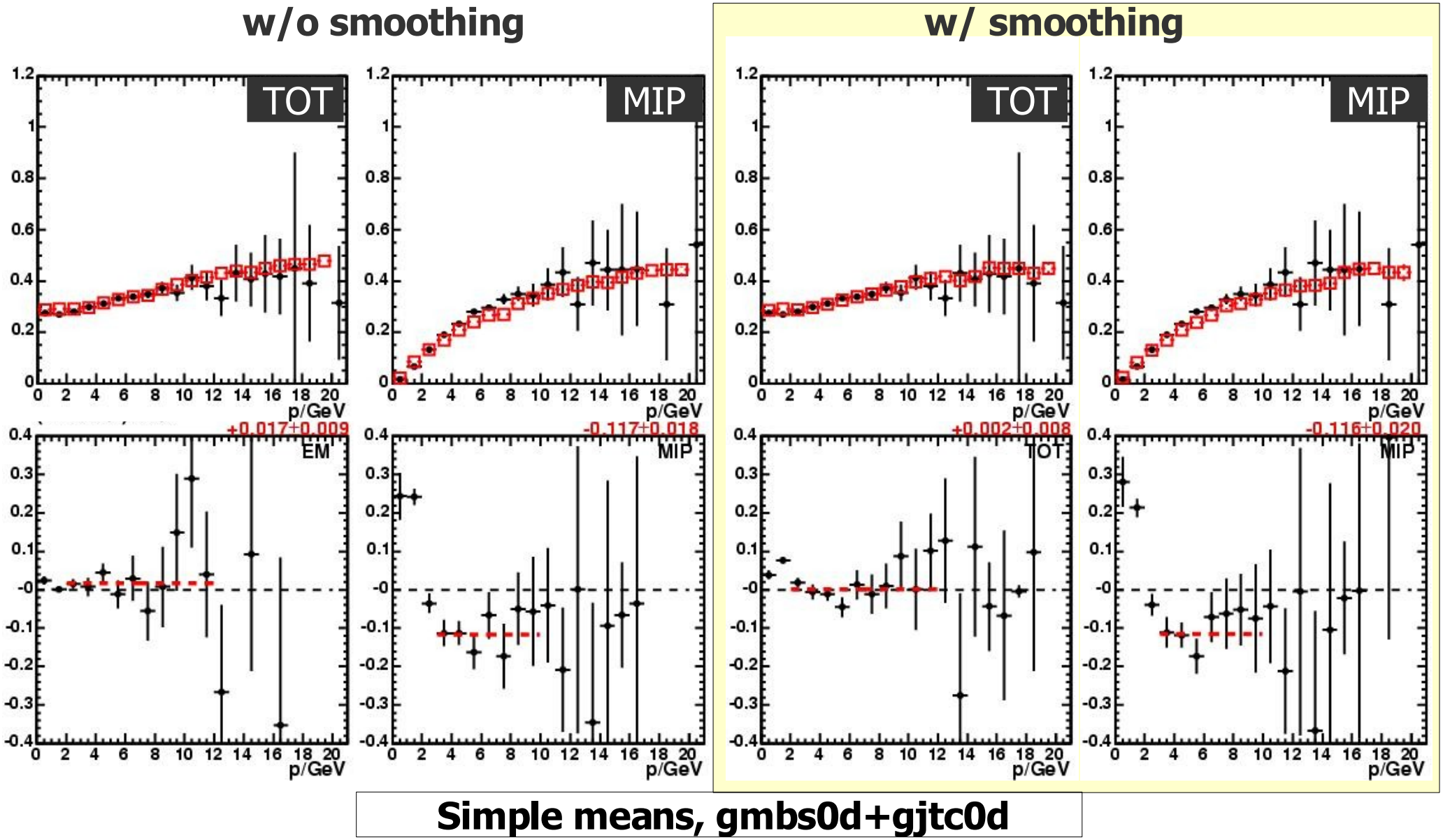
- Better description of data at p>10GeV/c.

f6 vs. Data (**Plug**)



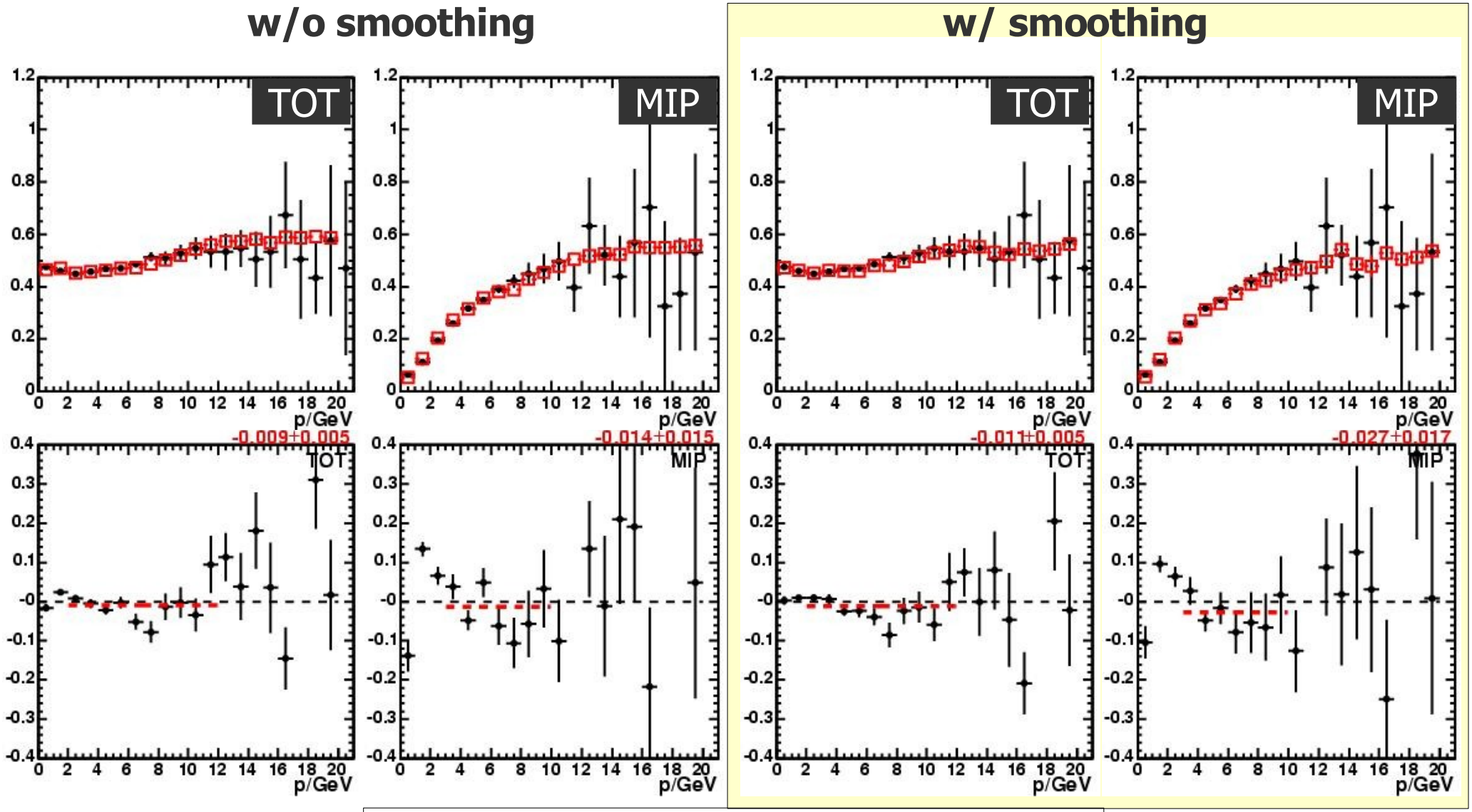
Simple means, gmbs0d

f6 vs. Data (**T10**)



- Picture didn't change much.

f6 vs. Data (**T11**)



Simple means, gmbs0d+gjtc0d

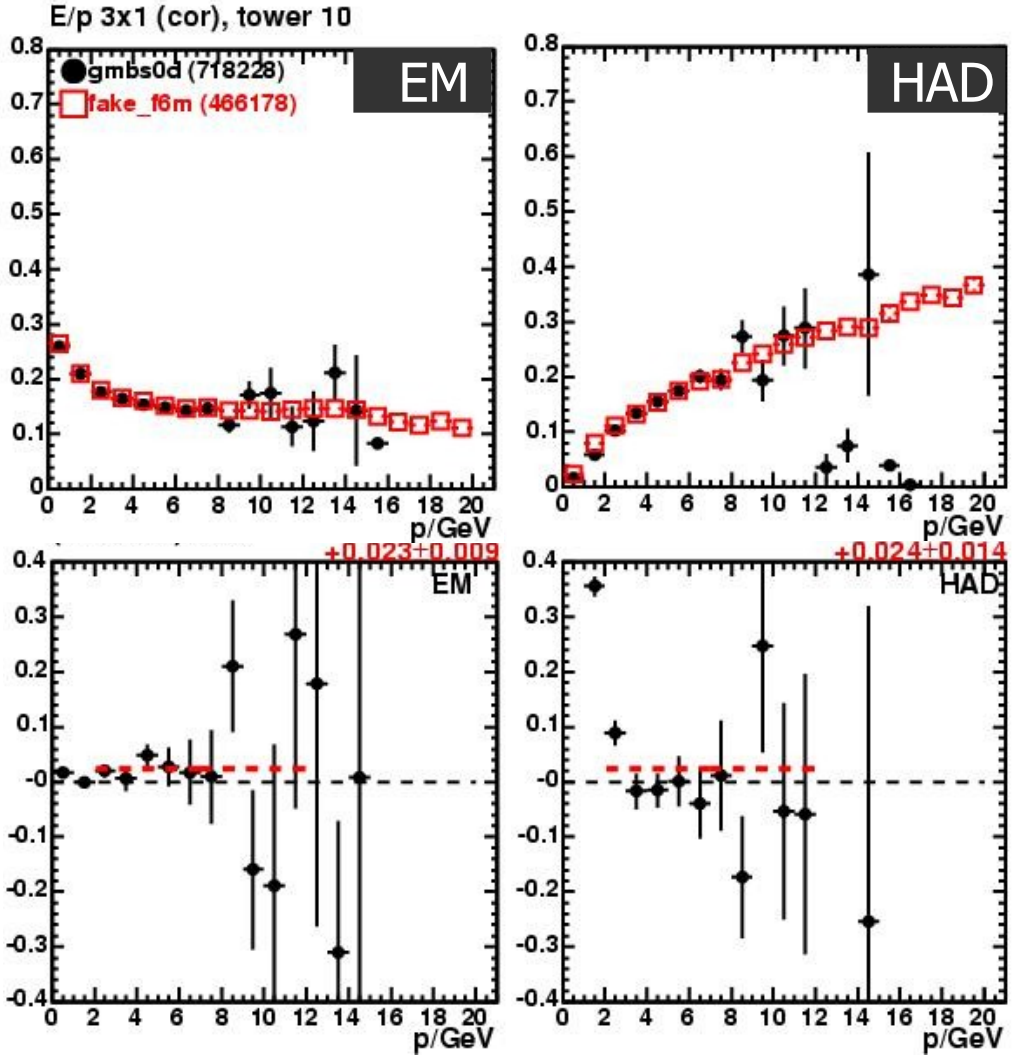
Conclusions

- Updated Plug and Crack parametrization has no discontinuity problem and provides better description of data.
- Smoothed f6 should replace the old f6 in view of Gen-7.
- Reduced excess of Gflash E/p response over data in the intermediate momentum region could help to reduce the discrepancies seen in di-jet balances. Revalidation would be useful.

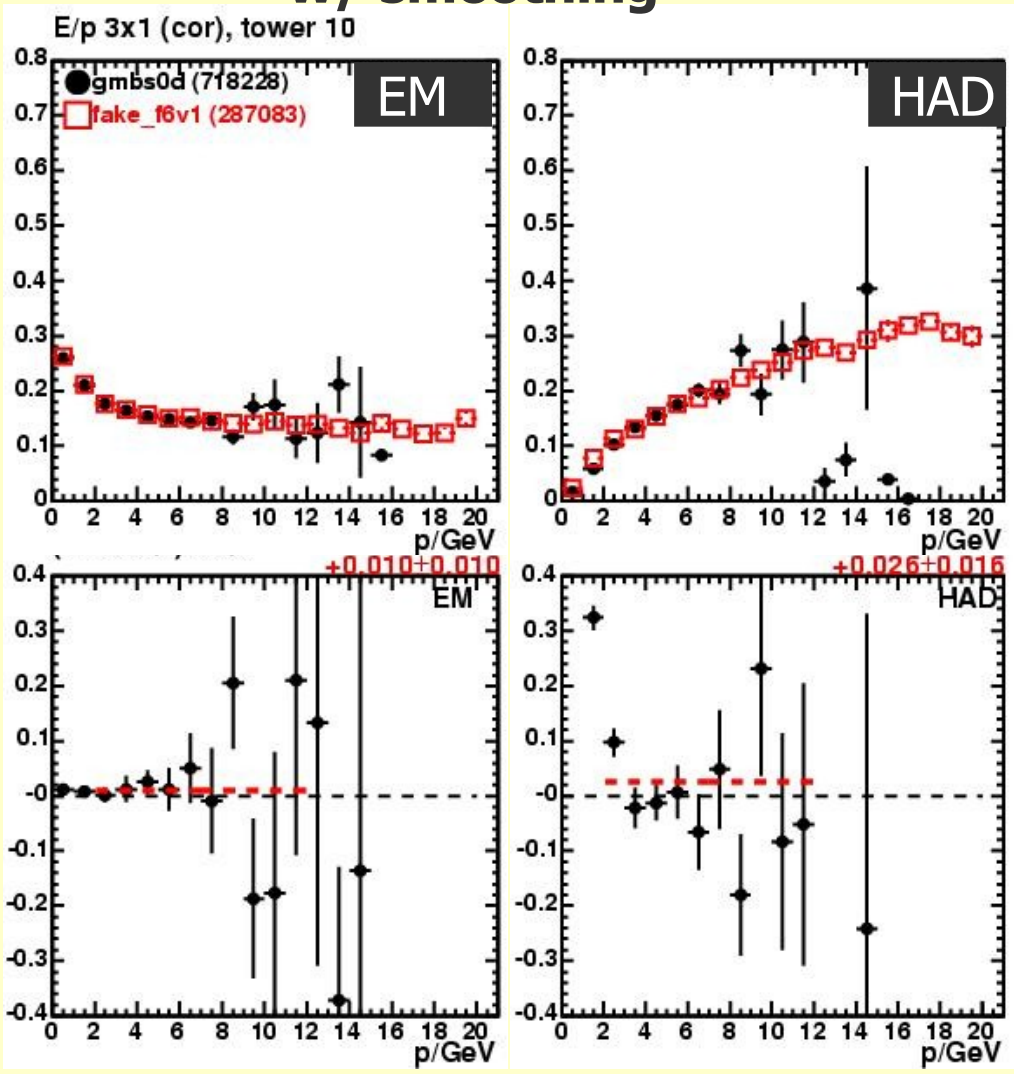
Backup

f6 vs. Data (**T10**)

w/o smoothing



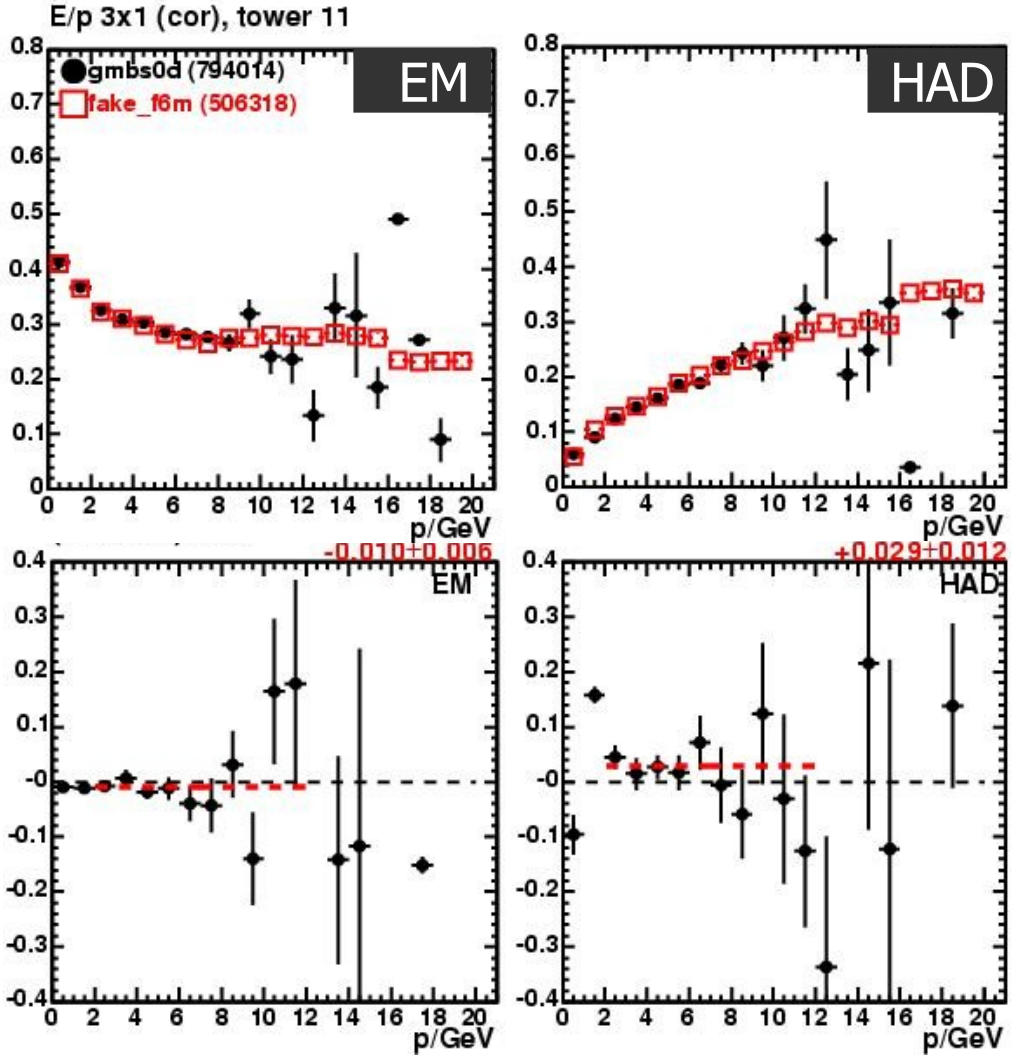
w/ smoothing



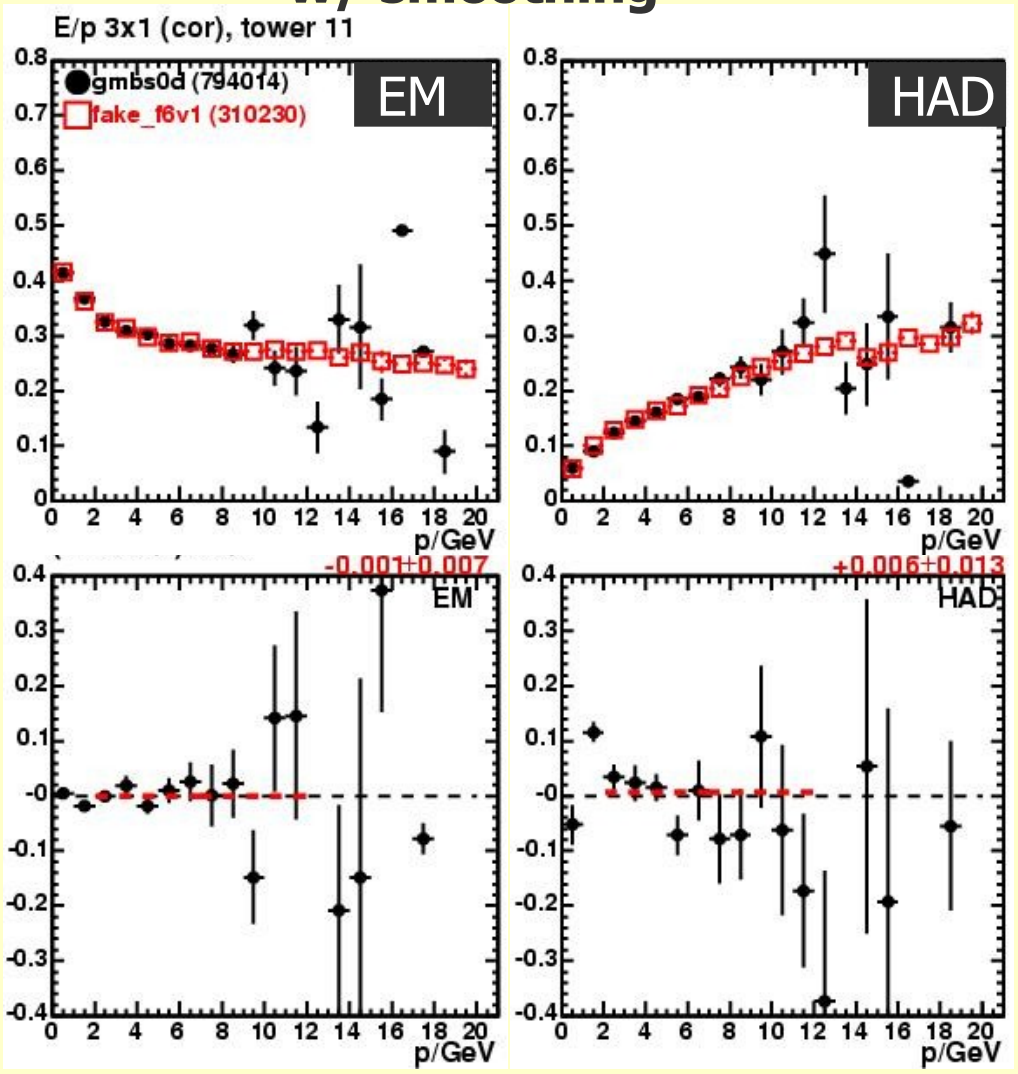
Simple means, gmbs0d

f6 vs. Data (**T11**)

w/o smoothing



w/ smoothing



Simple means, gmbs0d