Gflash Hadronic Lateral Profile in Crack and Plug

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Simulation Group Meeting Apr 6th, 2006

Introduction

Reminder:

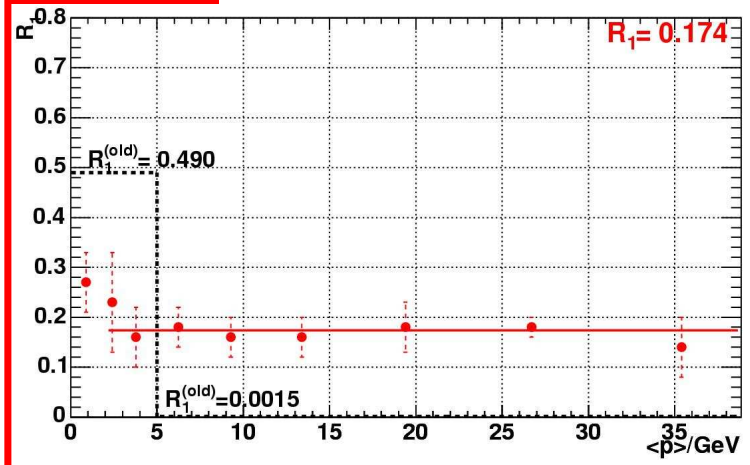
- Gflash hadronic lateral profile parameters were recently optimized to describe the hadronic profiles induced by single charged particles up 42 (24) GeV/c in the Central (Plug) region.
- Central and Plug results are “similar”, Central results a little more stable (due to MC statistics), so we decided to take the latter as global parametrization

This talk:

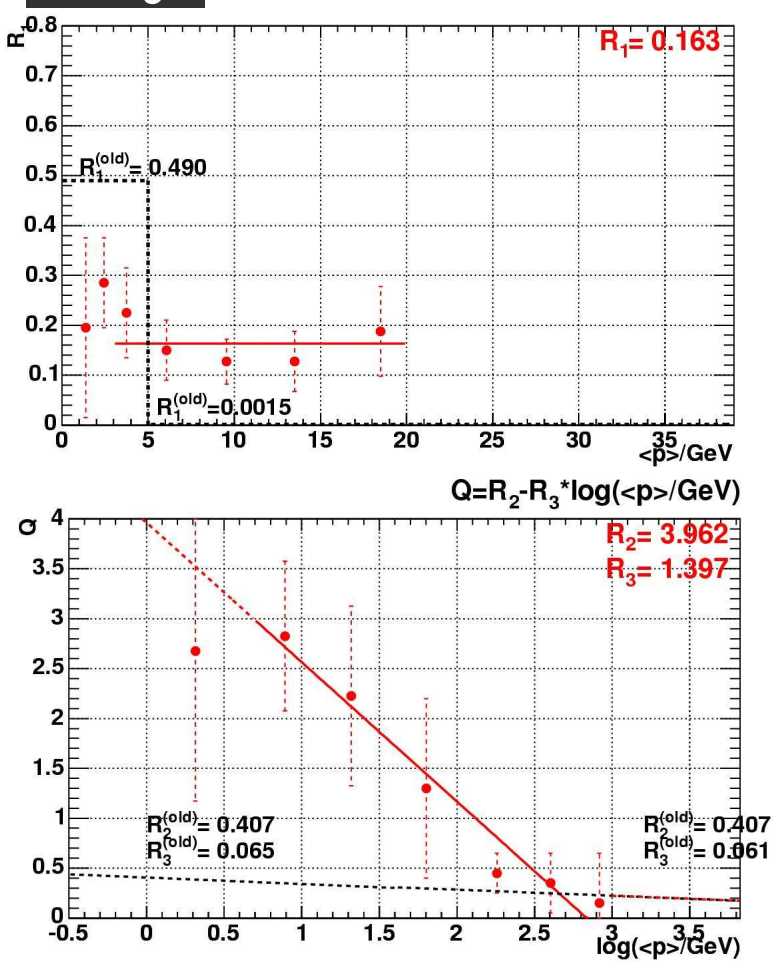
- Evaluation of the experimental profiles in Crack and Plug using all available STT data sets as well as MB samples
- Detailed comparison with MC (FakeEv + MB) based on cdfSim/ProductionExe 6.1.4int1

Lateral Profile Tuning Status

Central



Plug



- New profiles are narrower for p< 5GeV/c and broader for p>5GeV/c.
- New Central profiles are slightly broader than optimized Plug profiles.

Currently we are using parameter values from the tuning in the central for all calorimeter parts.

Data Sets

Single Track Trigger Data:		statistics	production
• 3, 4, 7 GeV/c thres.:	gjtc0d	~16M events	5.3.3_nt
• 10 GeV/c thres.:	gjtc0h_stt10	~4M events	6.1.2
• 15 GeV thres:	gjtc0h_stt15	~6M events	6.1.2
Minimum Bias Data:			
• gmbs0d		~21M events	5.3.3_nt

Remarks:

- STT data contain single tracks in crack/plug region as byproduct
- STT data has no visible threshold effects in crack/plug:
  Have verified that there are no charge asymmetries (as e.g. observed in gjtc0h_stt15 sample in the central)

MC Samples

Generated isolated tracks using FAKE_EV:

- 3 tracks per event
- flat spectrum, $|\eta| = 0.72 - 2.1$ (covering towers 6 to 17)
- pions/kaons/protons ~ 6/3/1
- processed with cdfSim / ProductionExe 6.1.4int1 (MCv6 B)

Pythia Minimum Bias Tune A superimposed on top of each event

Track Selection

Event quality:

- Number of vertices: 1
- |Z(vertex)| < 60cm

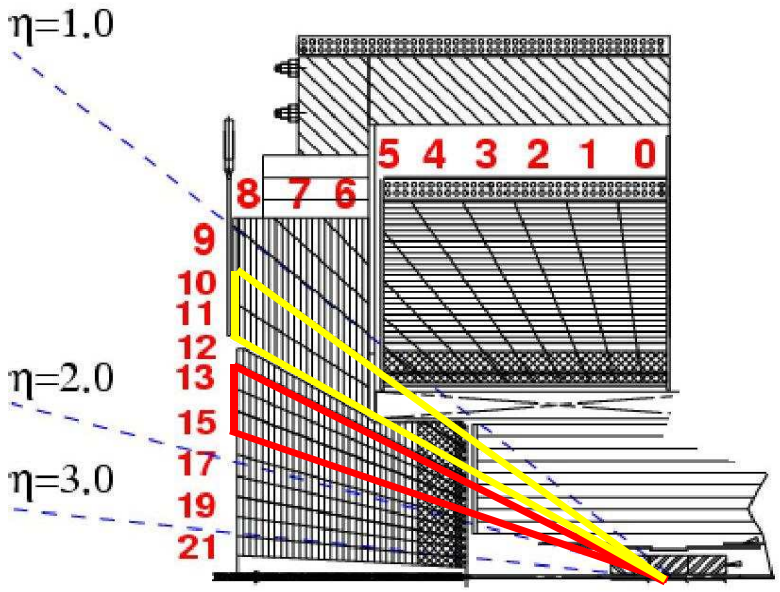
Signal region:

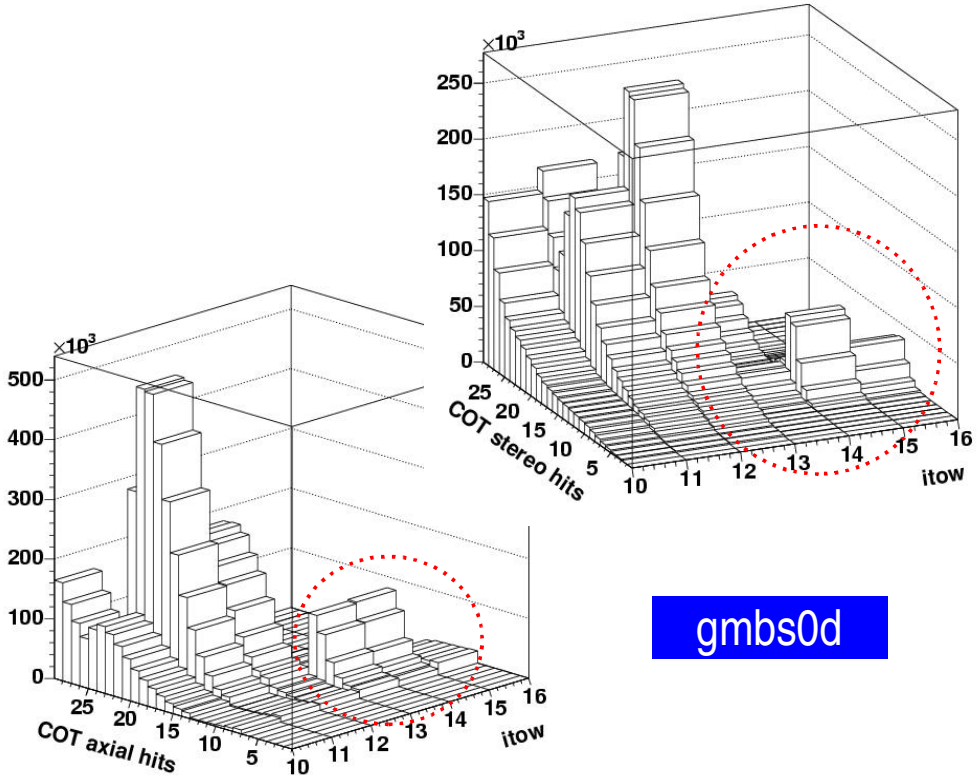
- 7x7 isolation
- Track extrapolates to PES of signal regions:
  "Crack" = Tower 10 and 11
  "Plug" = Tower 13, 14, 15
- Partial CES isolation for crack towers

Track quality:

	COT hits		Silicon hits		
	axial	stereo	axial	stereo	z
Crack:	≥20	≥20	≥4	-	-
Plug:	≥7	≥7	≥4	≥2	≥2

Using IO tracks is crucial for reasonable E/p measurement in the plug!
(see e.g. my SGM talk of July 20, 2005)



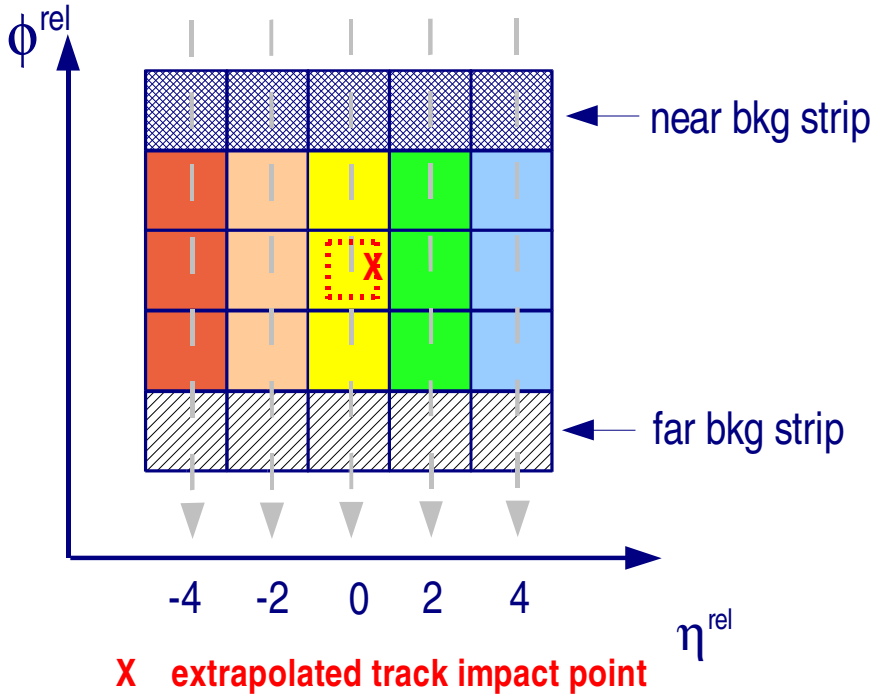


gmbs0d

Signal Definition

Measure E/p in five towers adjacent in η

- Signal = E/p (target tower)
  plus E/p (two towers adjacent in ϕ)
- Backgr= 1.5 x {E/p(far block) +E/p(near block)}



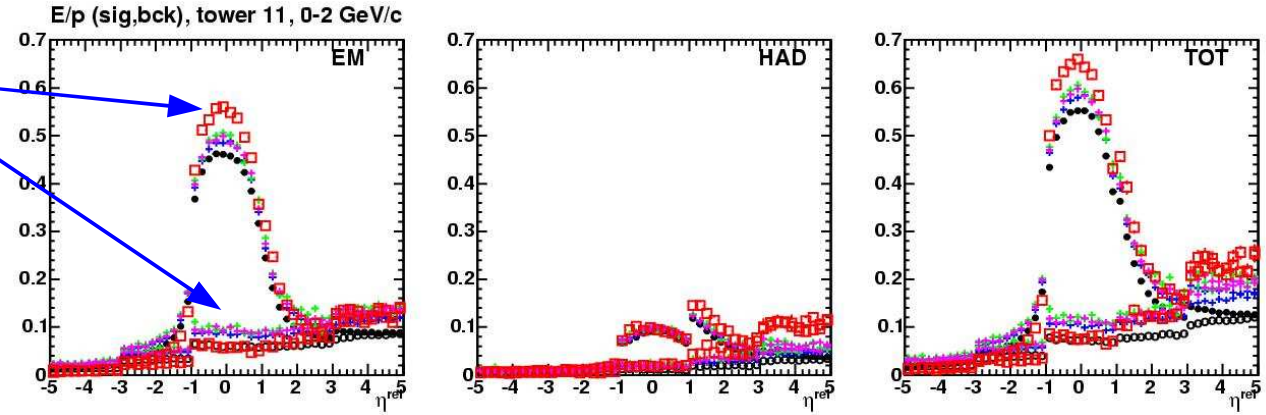
- Same definition for crack and plug
- Tracks are extrapolated to PES for both EM and HAD compartment
- Plug: adjacent towers in ϕ are paired
- Two kinds of plots:
  - E/p vs normalized η/ϕ coordinates w.r.t. track impact point
  - E/p vs tower coordinates w.r.t target tower (tune distribution)
    (require impact point be in inner 60% of target)

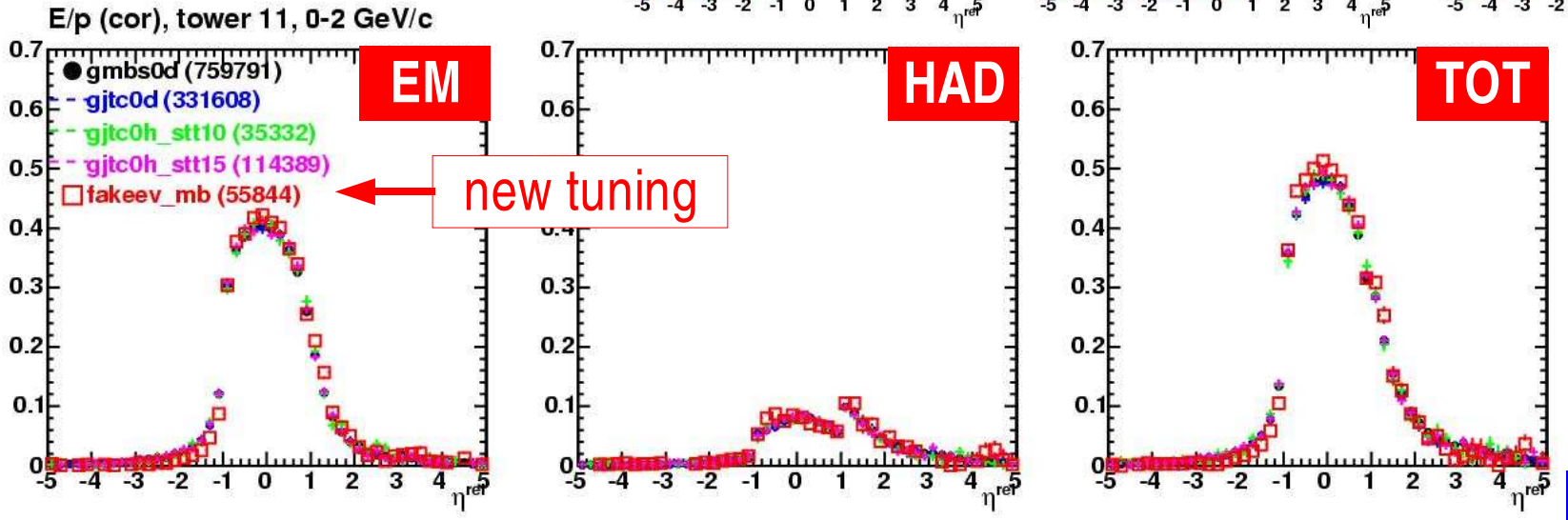
For data/MC comparisons shown in the following, **all histograms are normalized to the absolute energy of a reference histogram**, which usually is the measured lateral profile obtained from minbias sample gmbs0d! (Note that these normalized profiles were subject of previous tuning.)

Tower 11
(0.5-2 GeV/c)

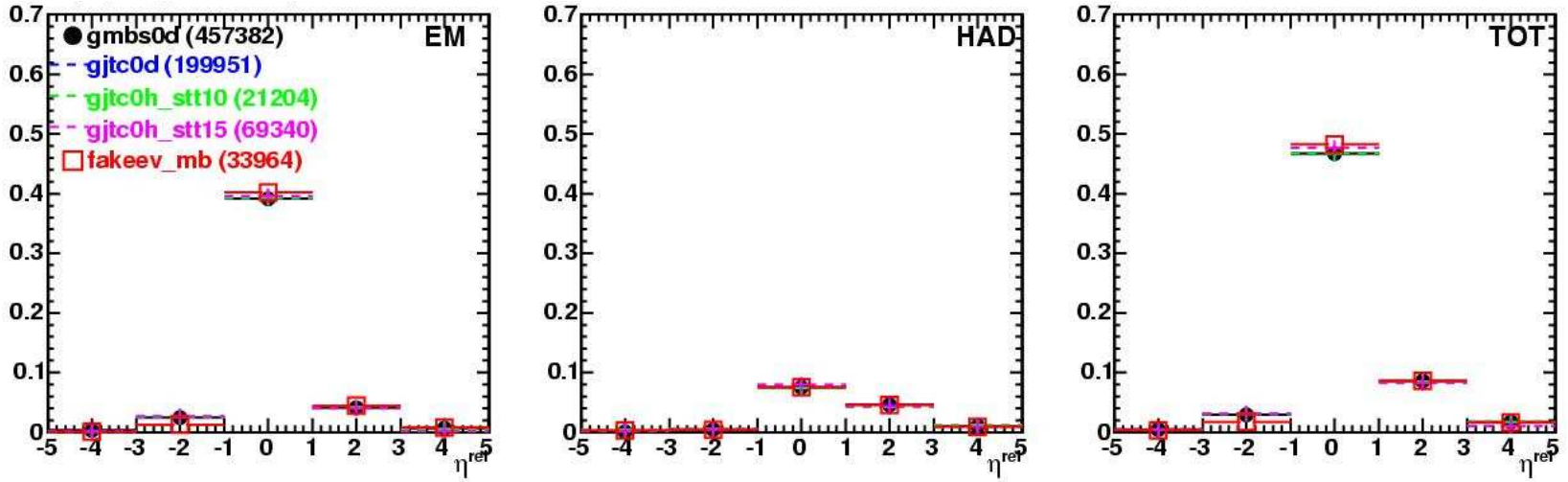
signal

background



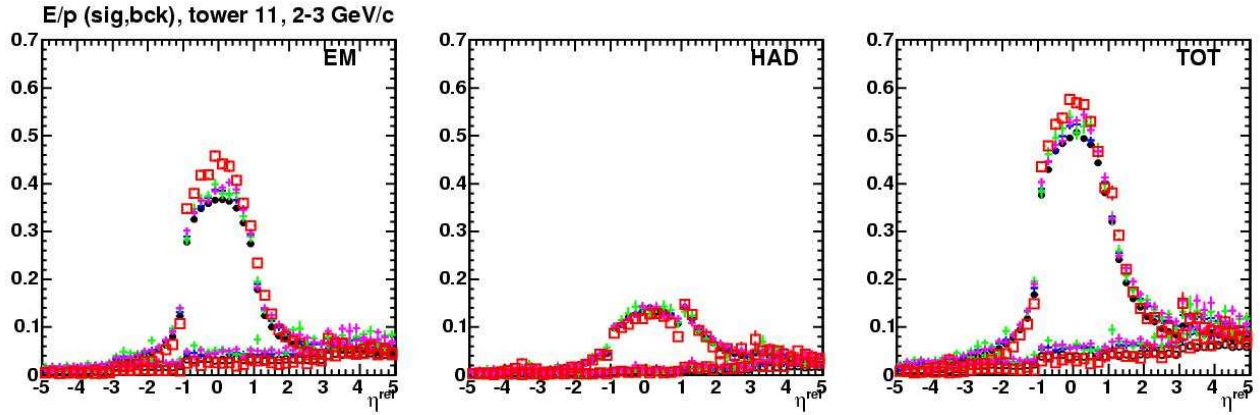


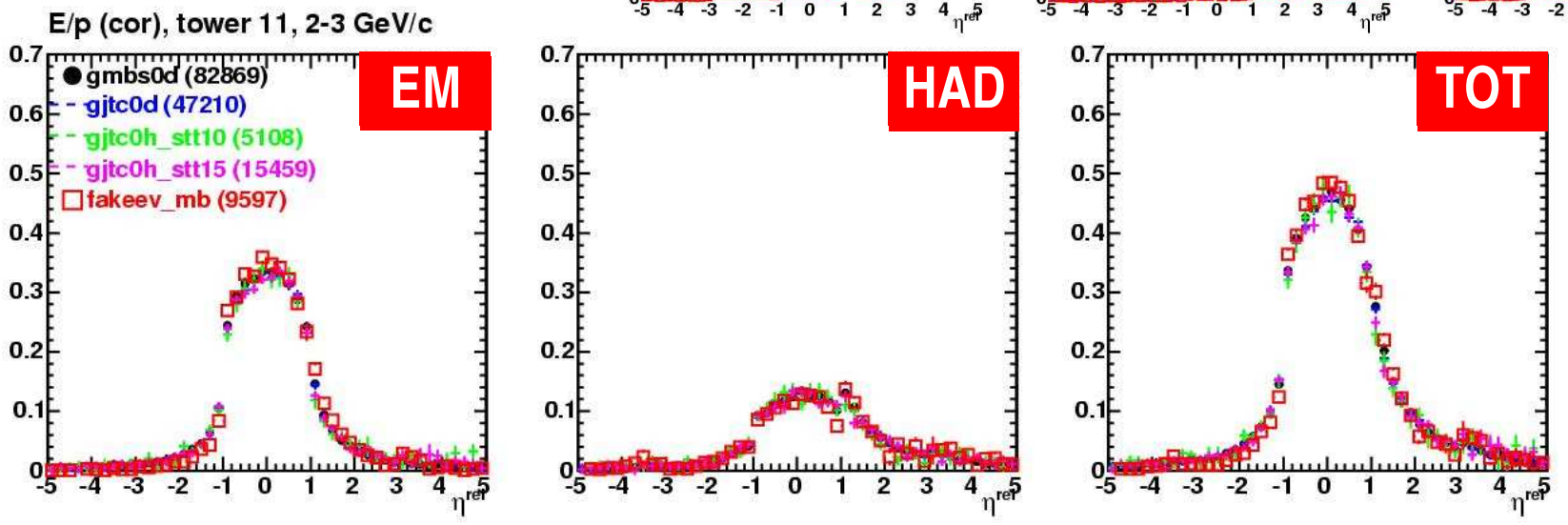
new tuning

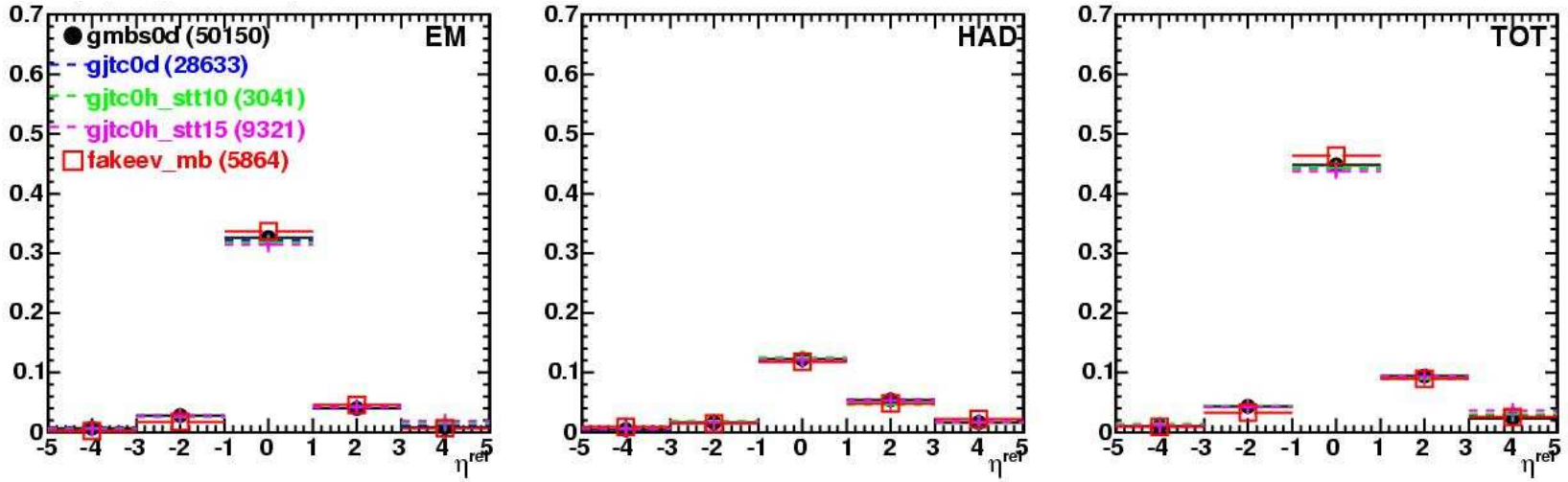


corrected

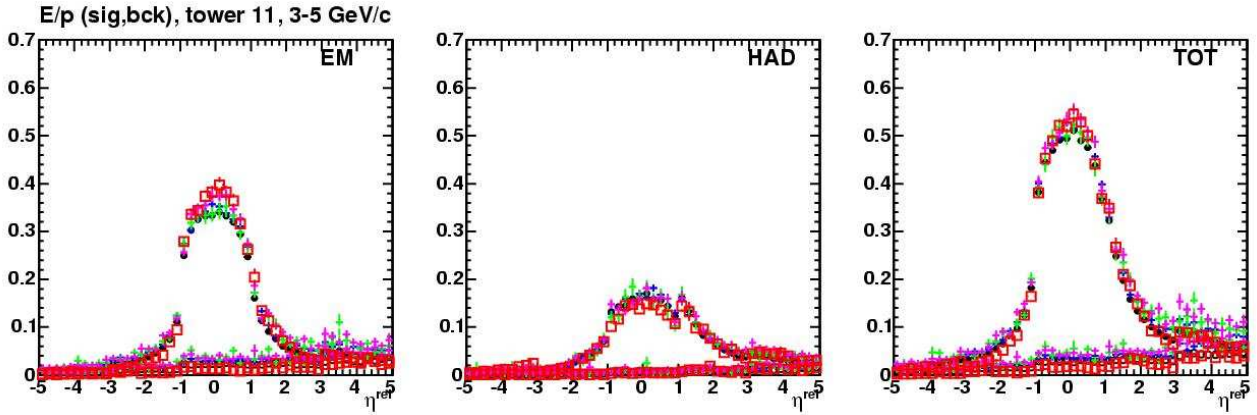
Tower 11
(2-3 GeV/c)

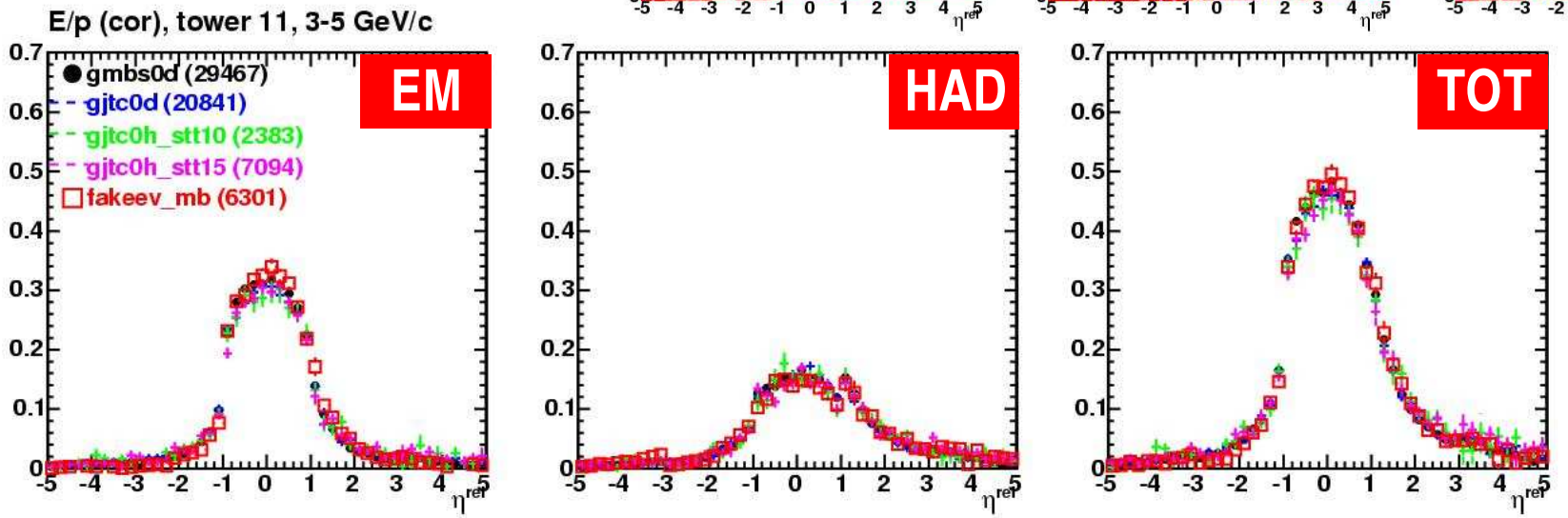


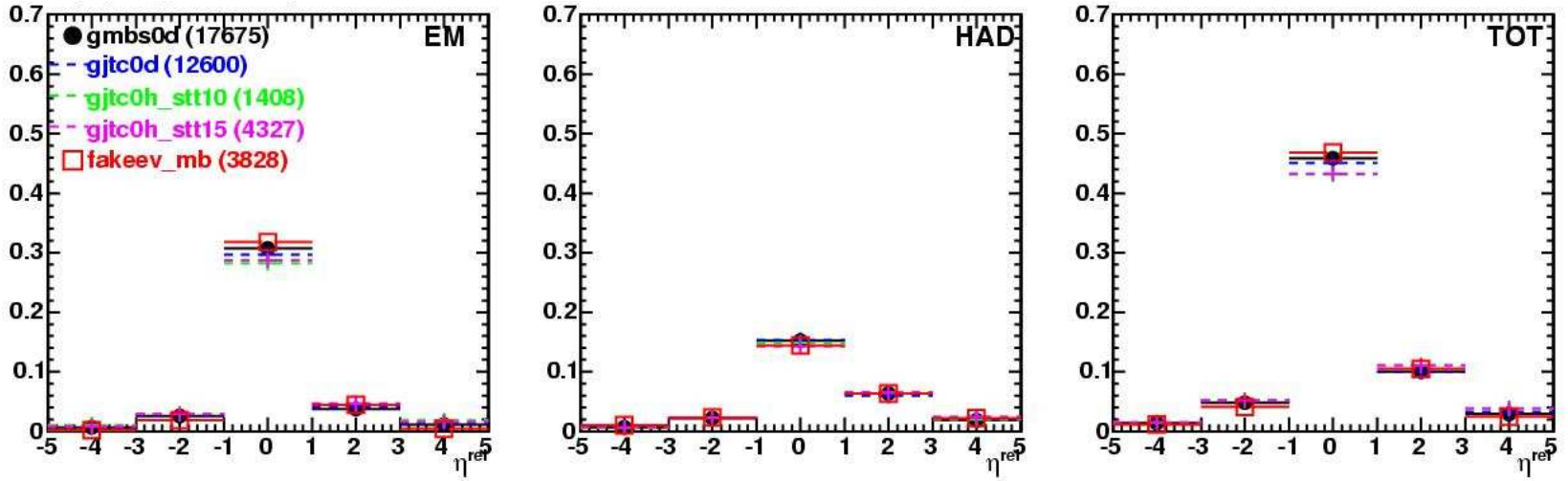




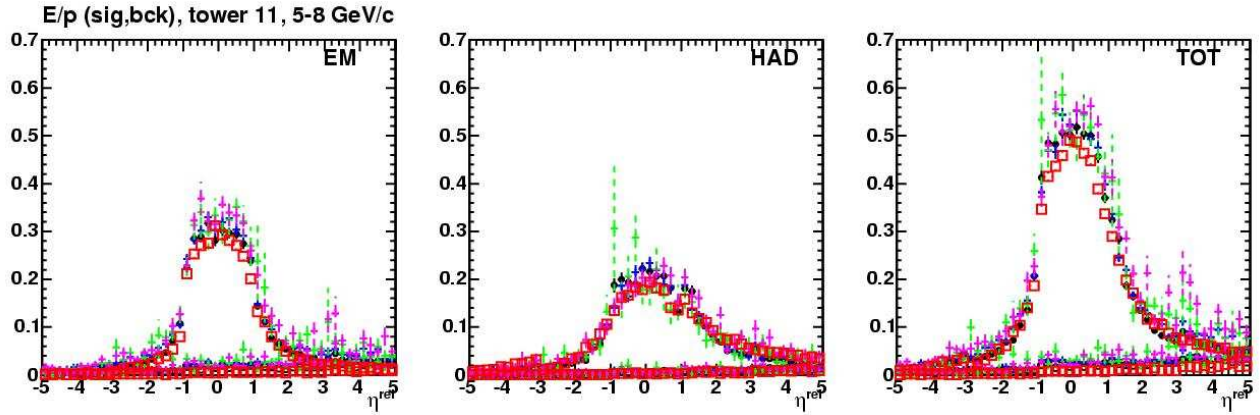
Tower 11
(3-5 GeV/c)

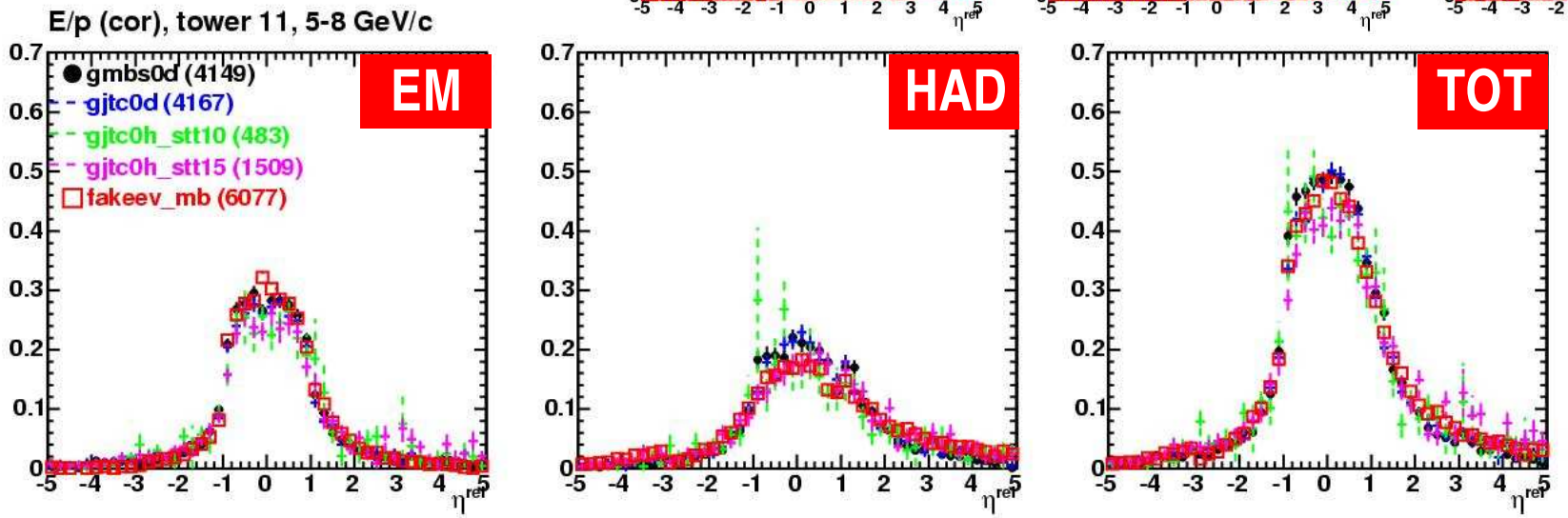


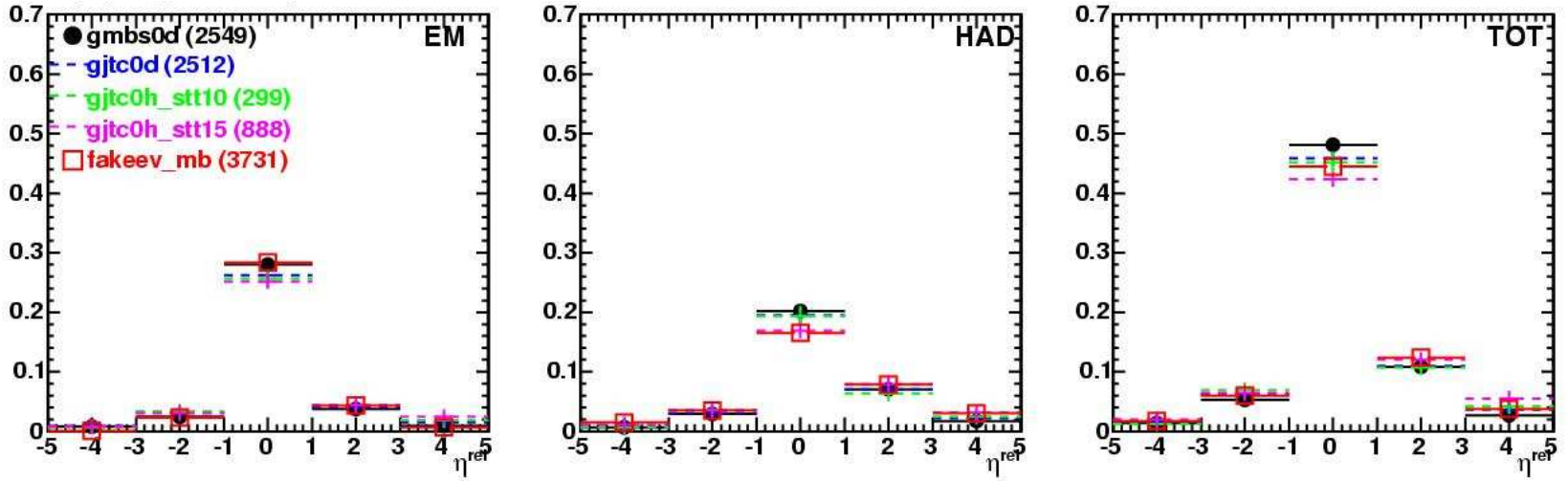




Tower 11
(5-8 GeV/c)

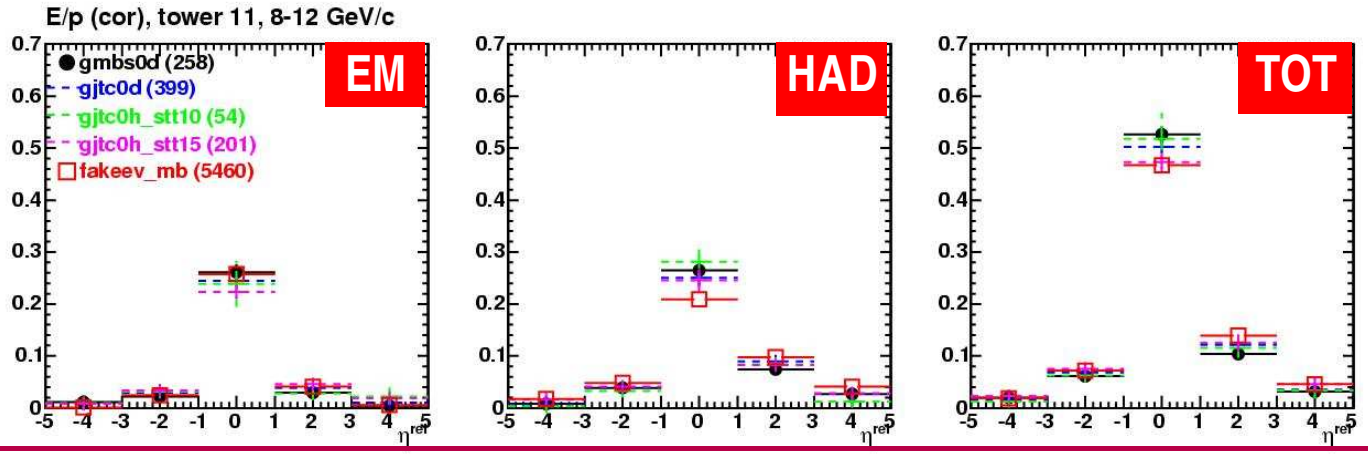




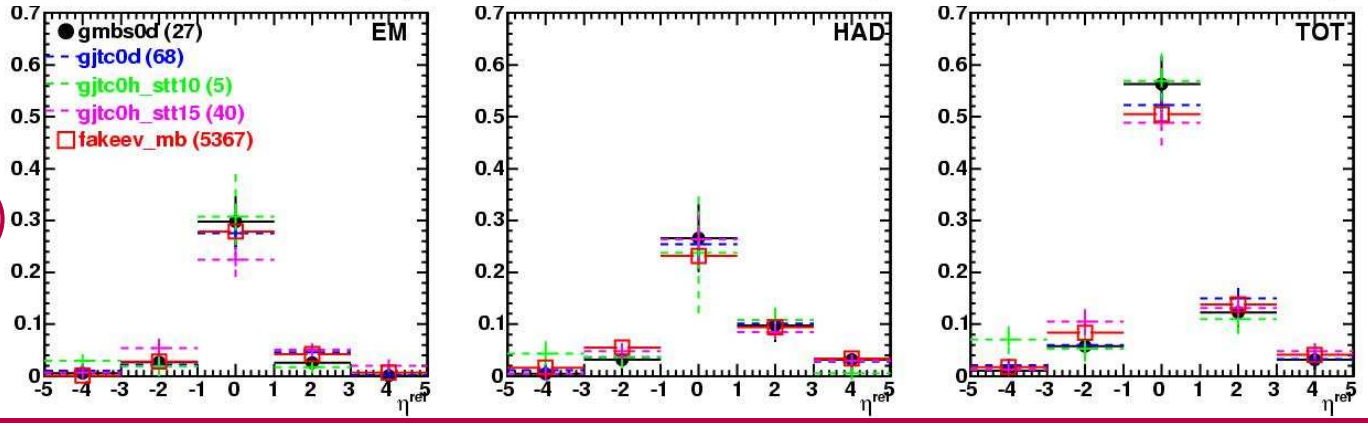


Tower 11

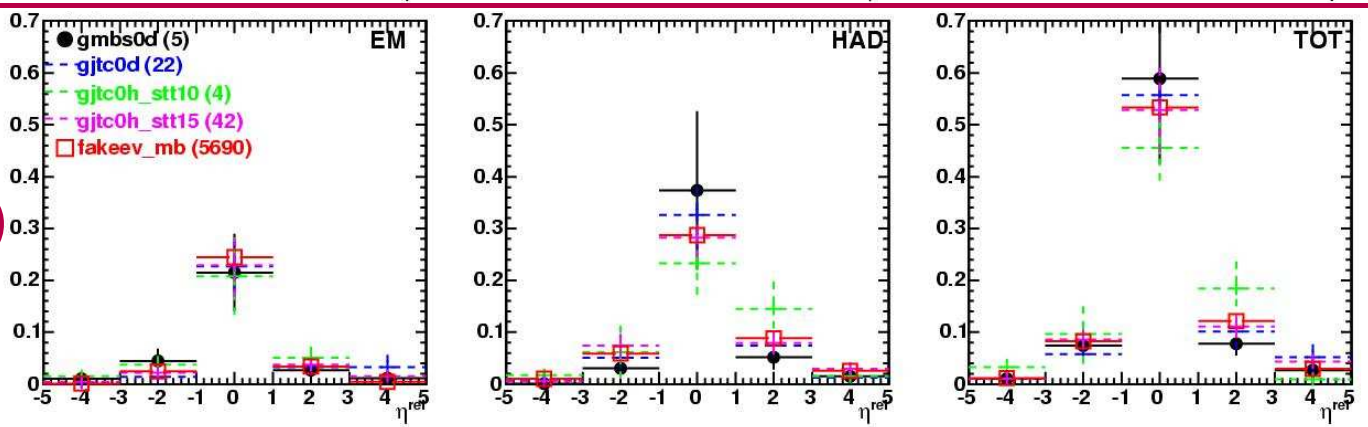
(8-12 GeV/c)



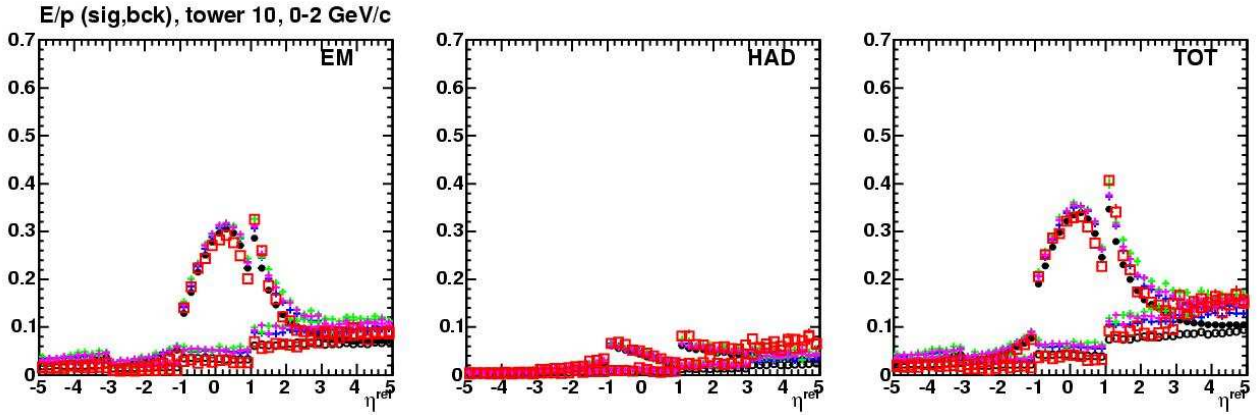
(12-16 GeV/c)

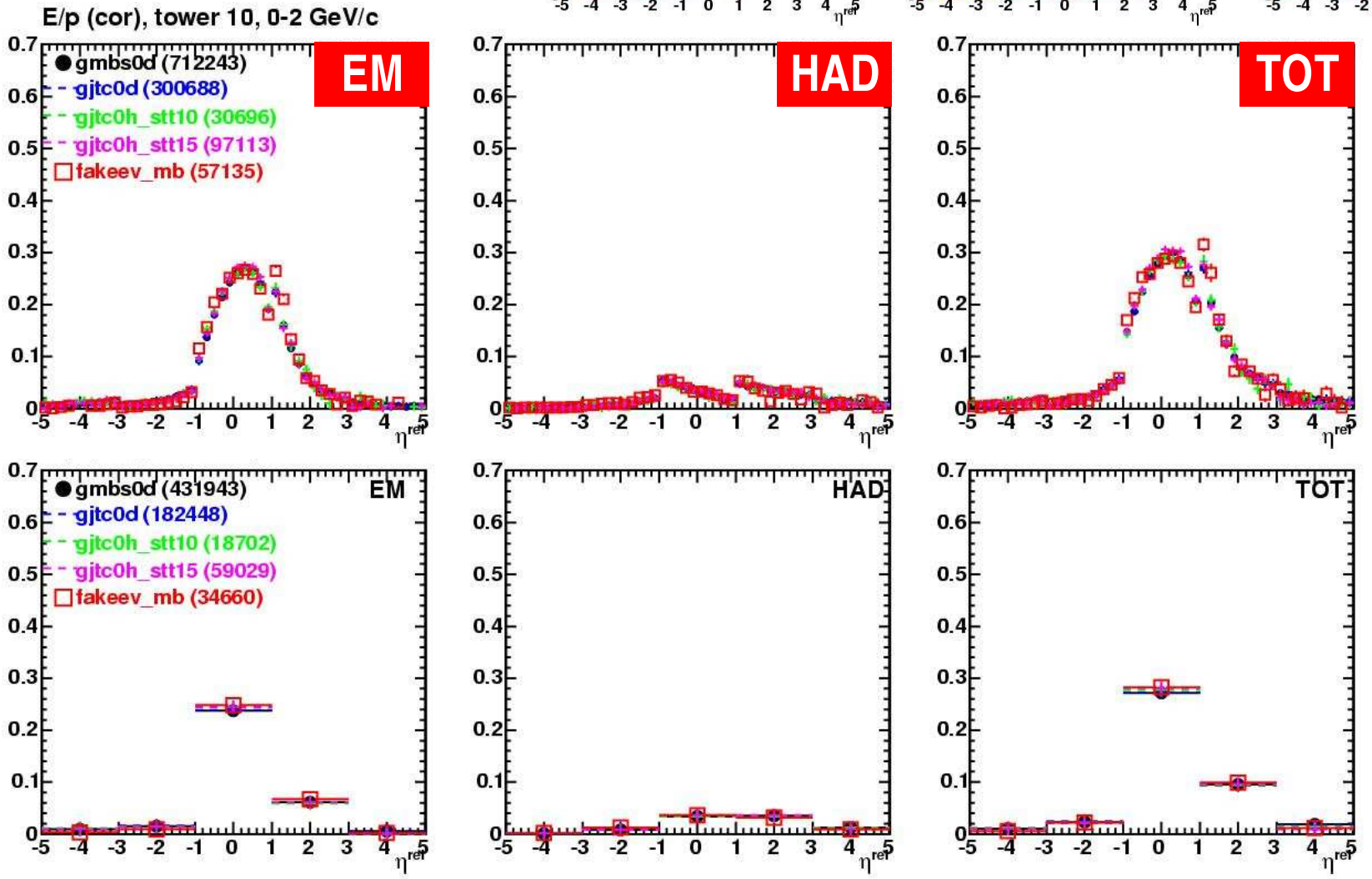


(16-24 GeV/c)

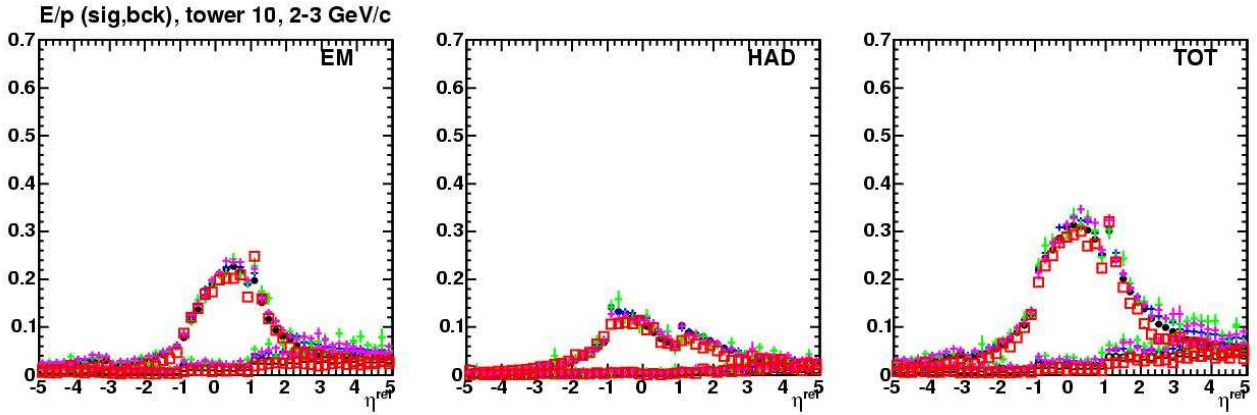


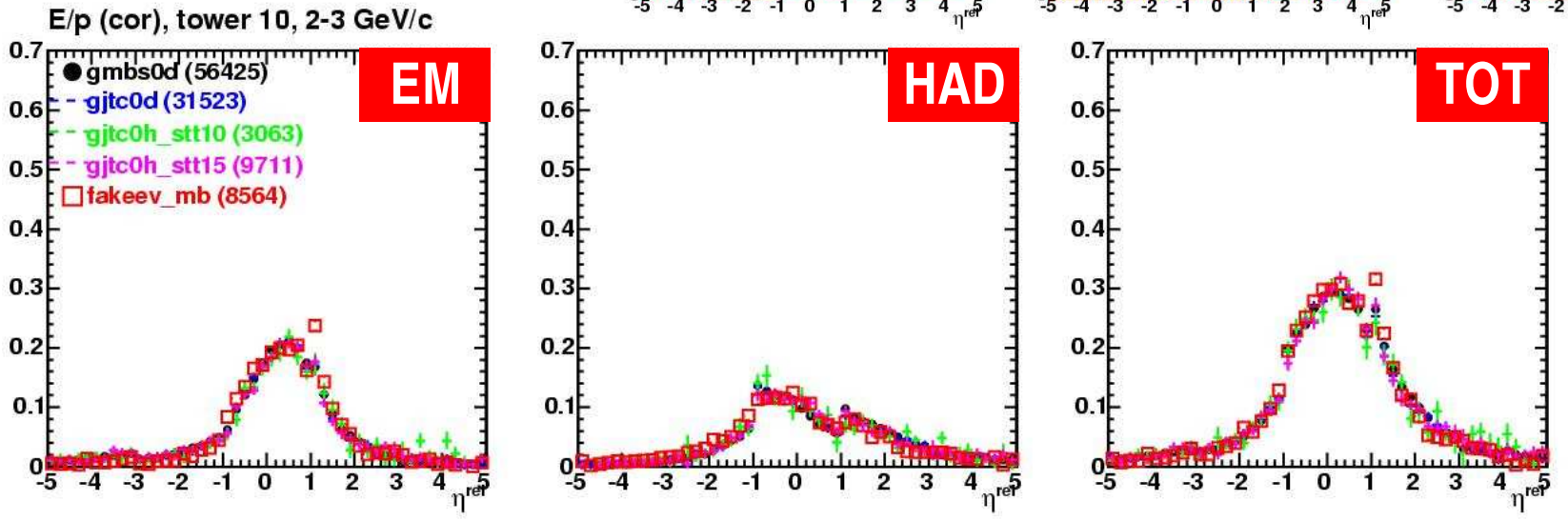
Tower 10
(0.5-2 GeV/c)

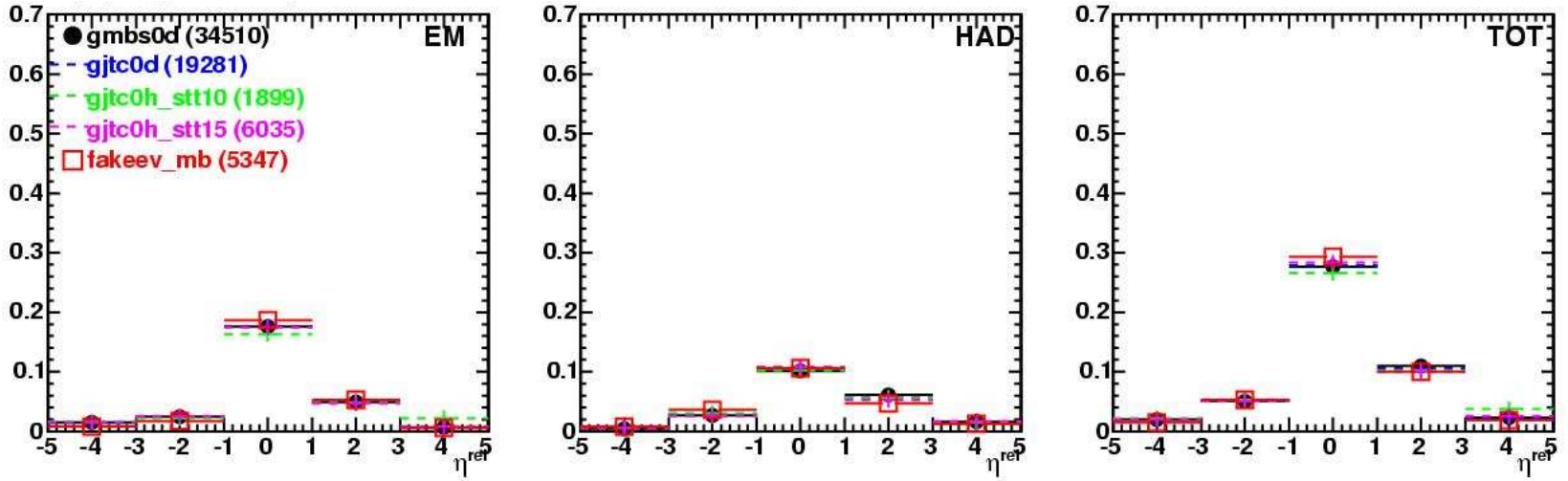




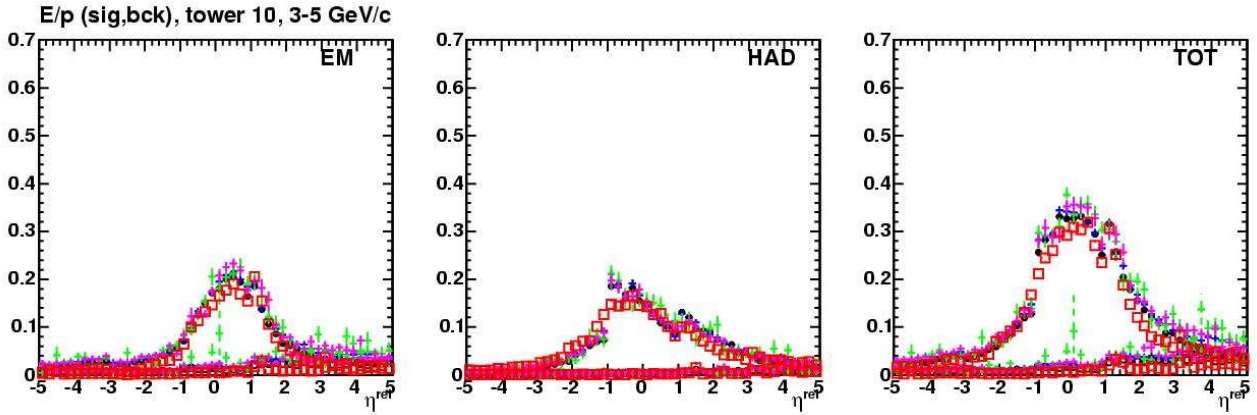
Tower 10
(2-3 GeV/c)

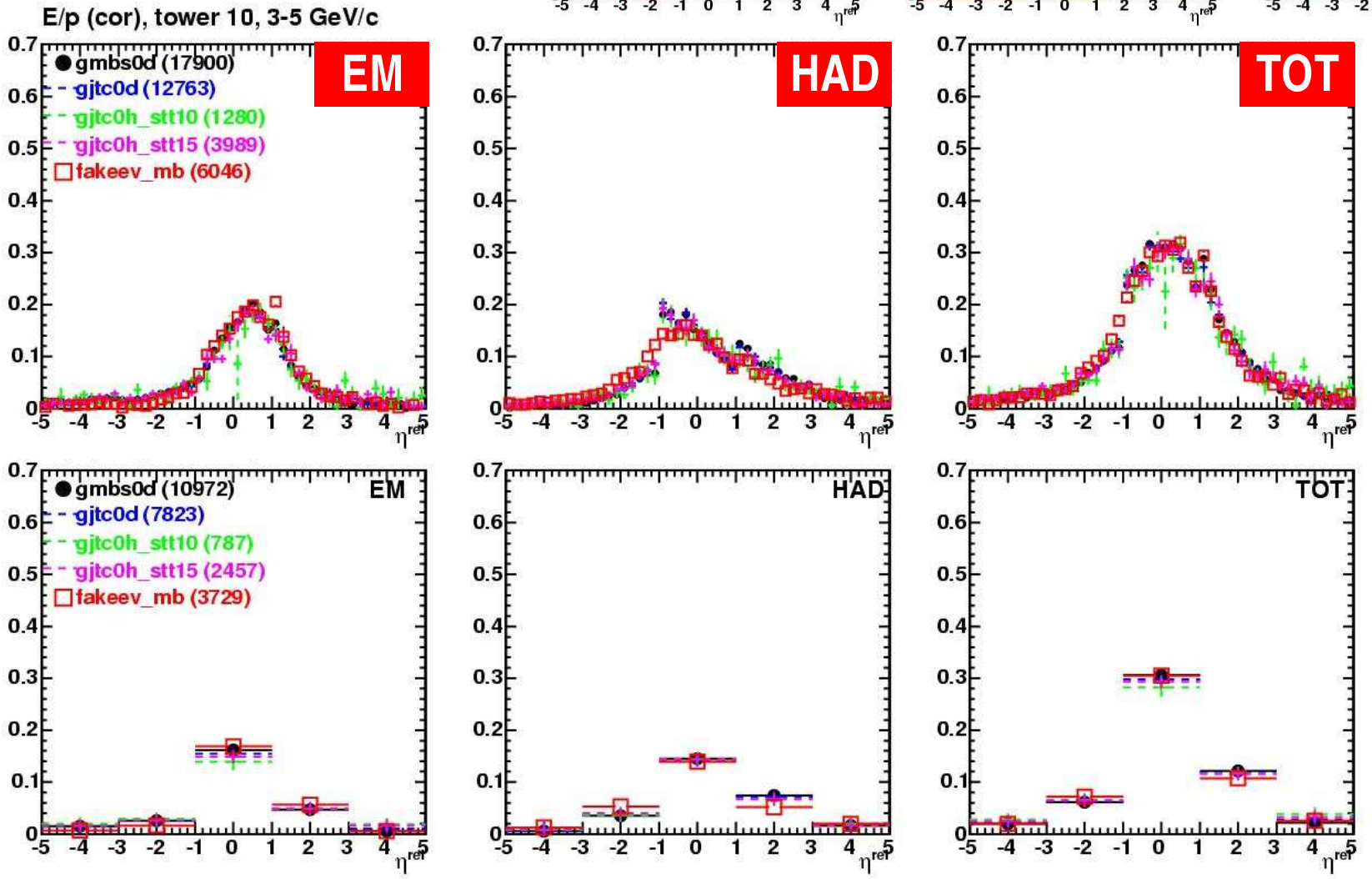




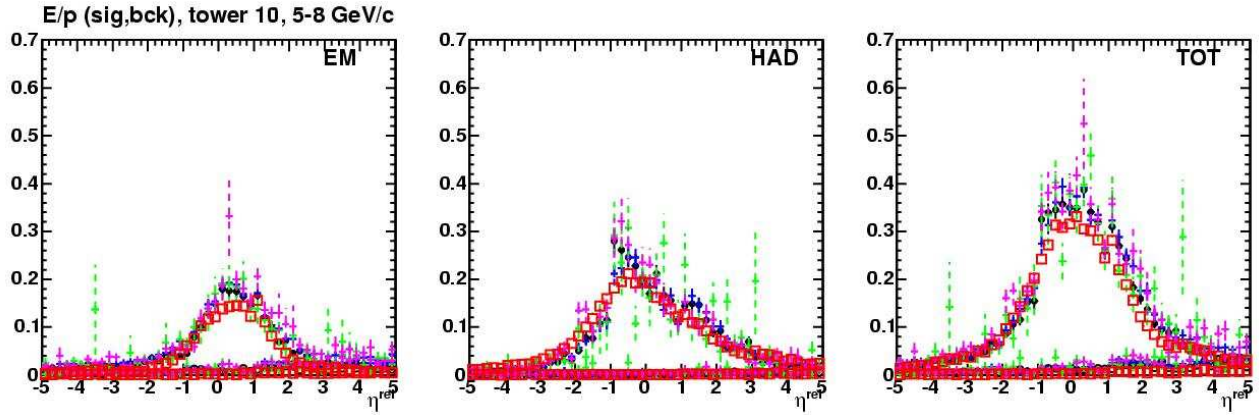


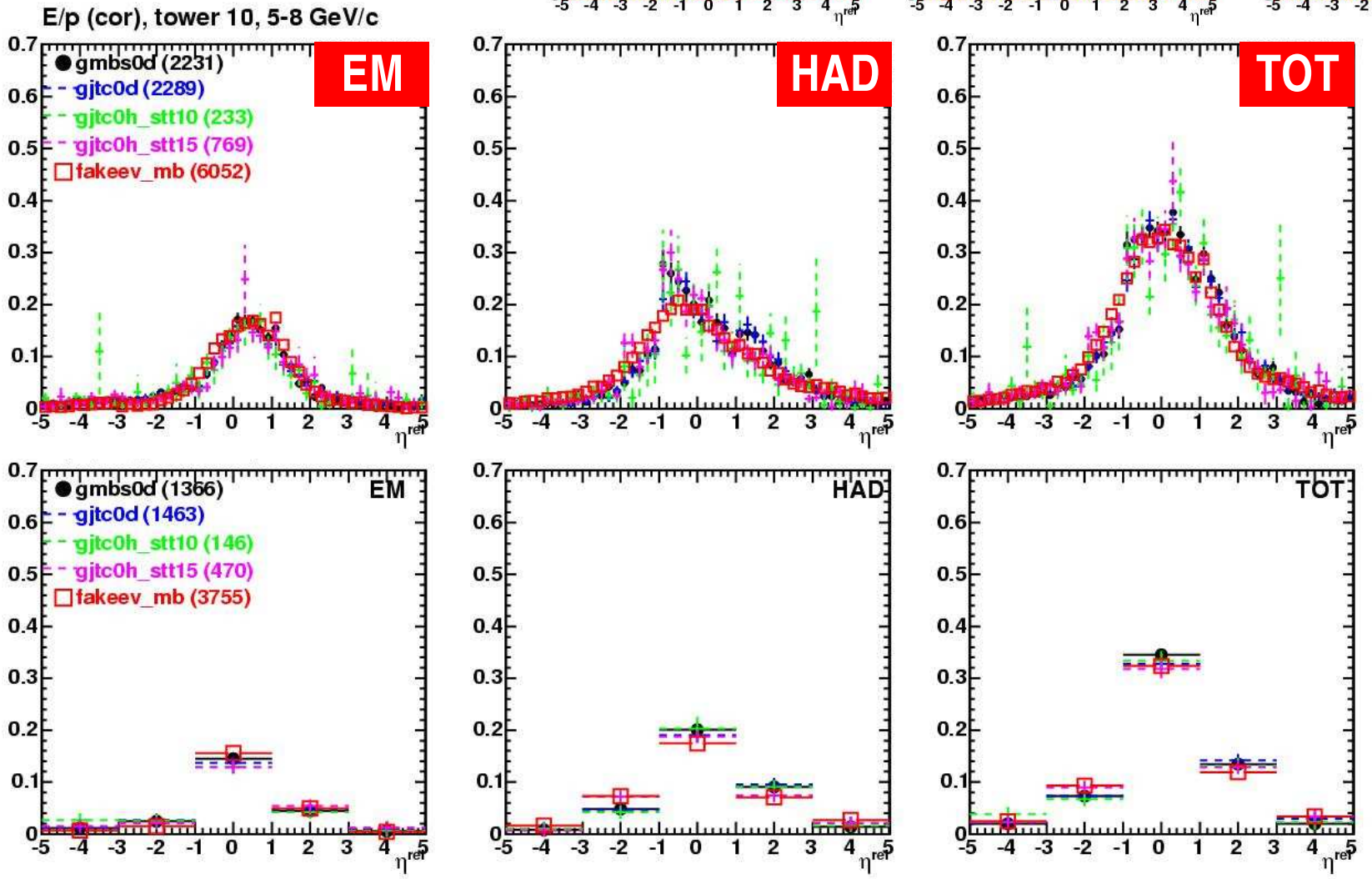
Tower 10
(3-5 GeV/c)





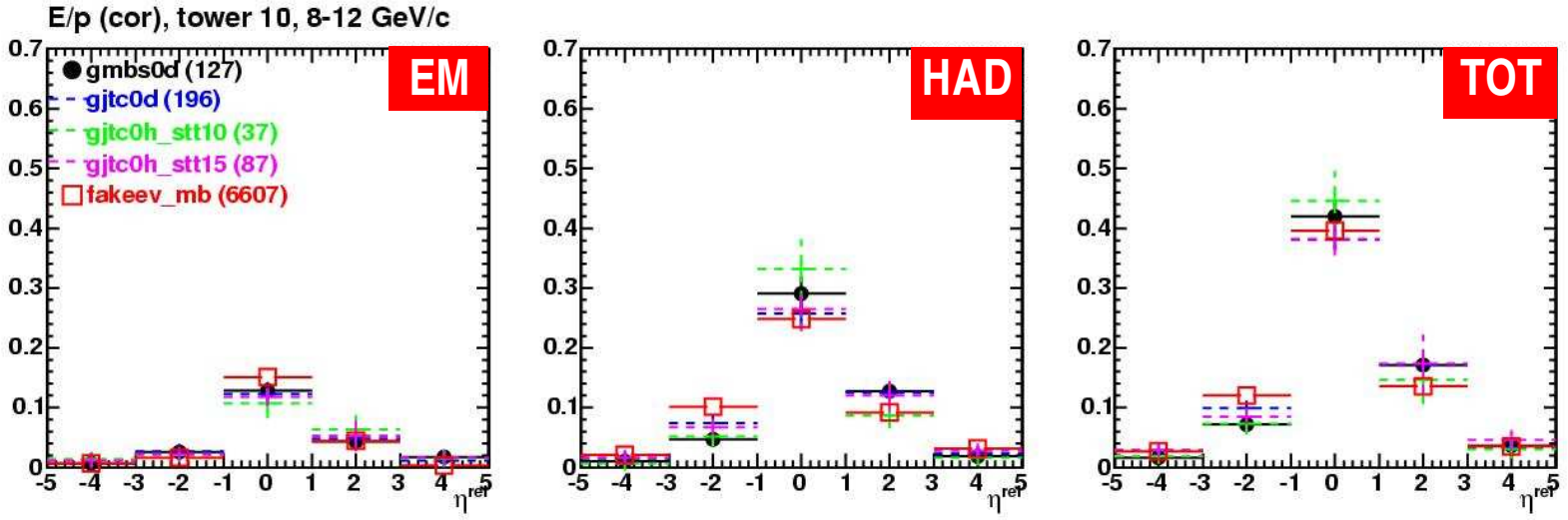
Tower 10
(5-8 GeV/c)



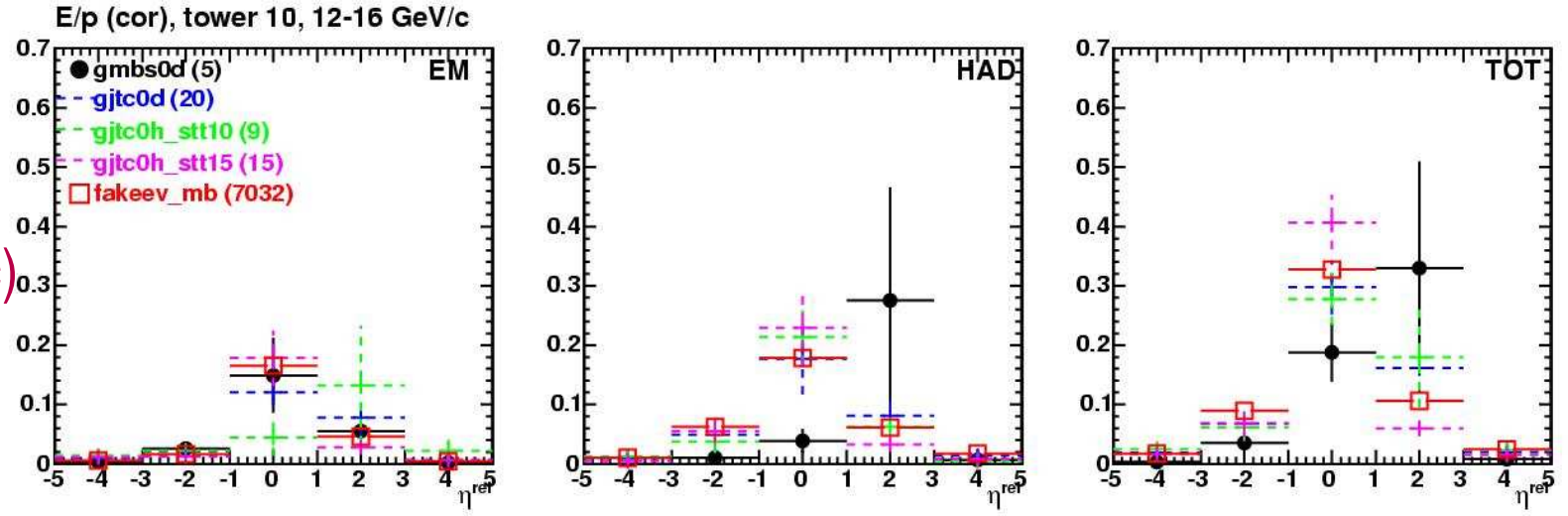


Tower 10

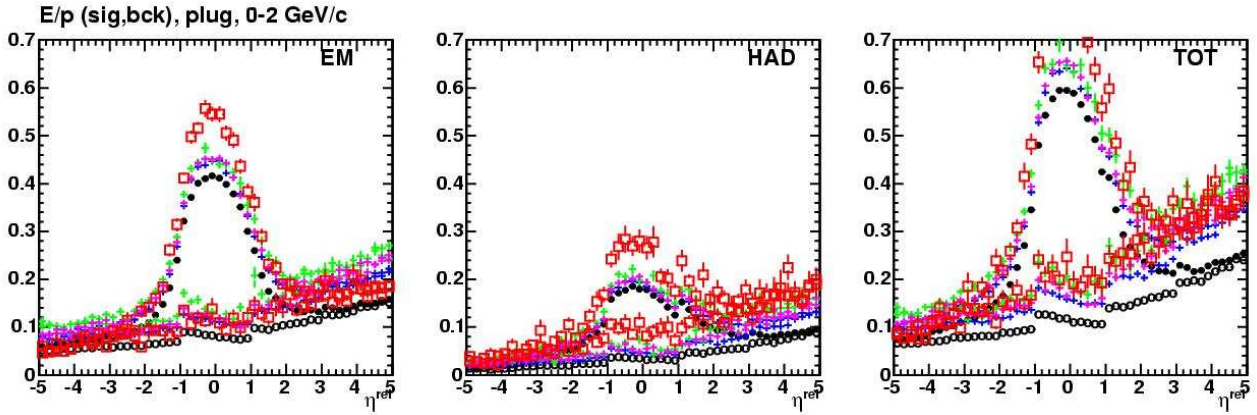
(8-12 GeV/c)

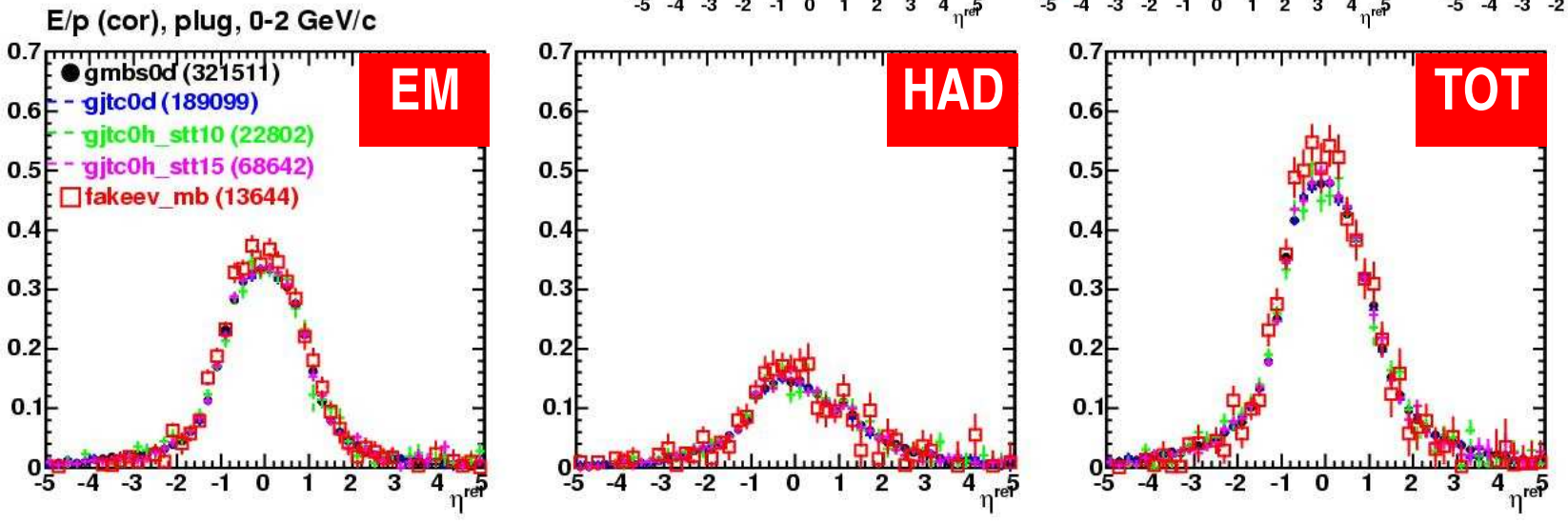


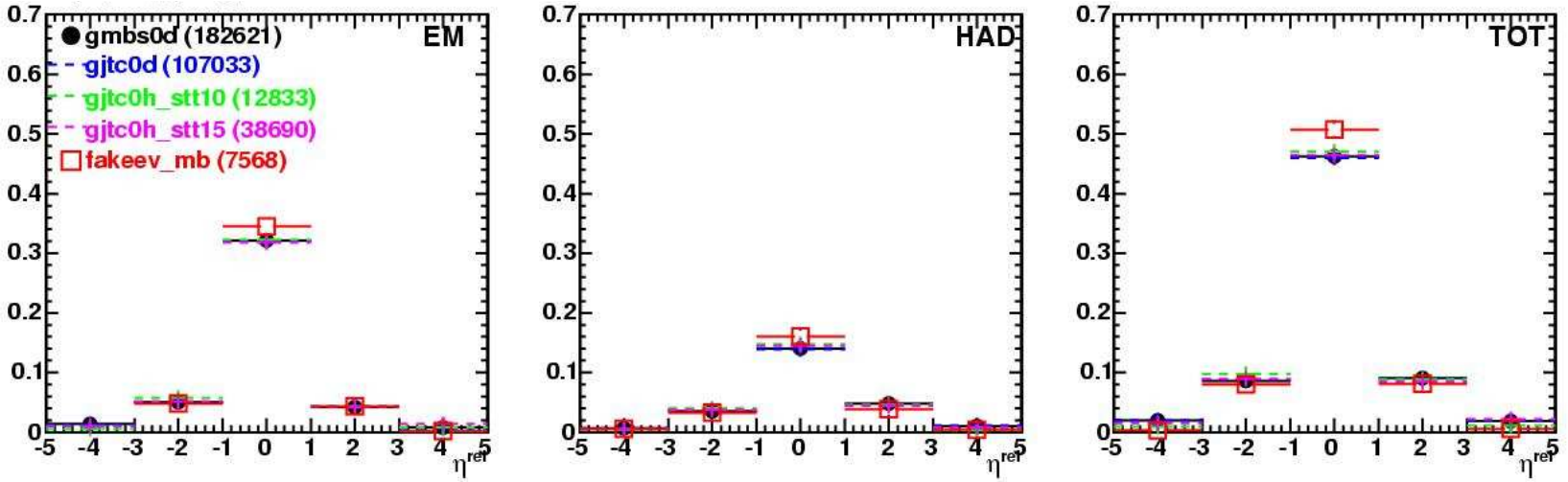
(12-16 GeV/c)



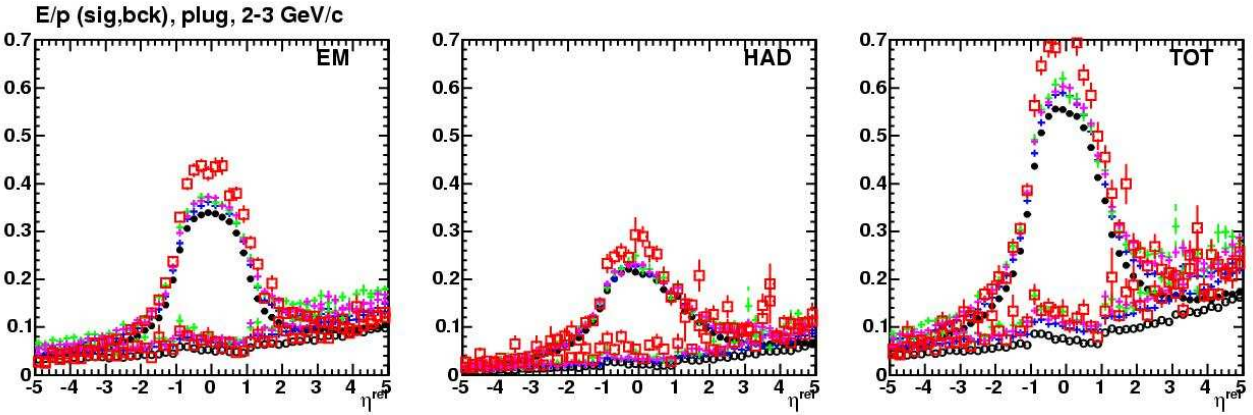
Plug (0.5-2 GeV/c)

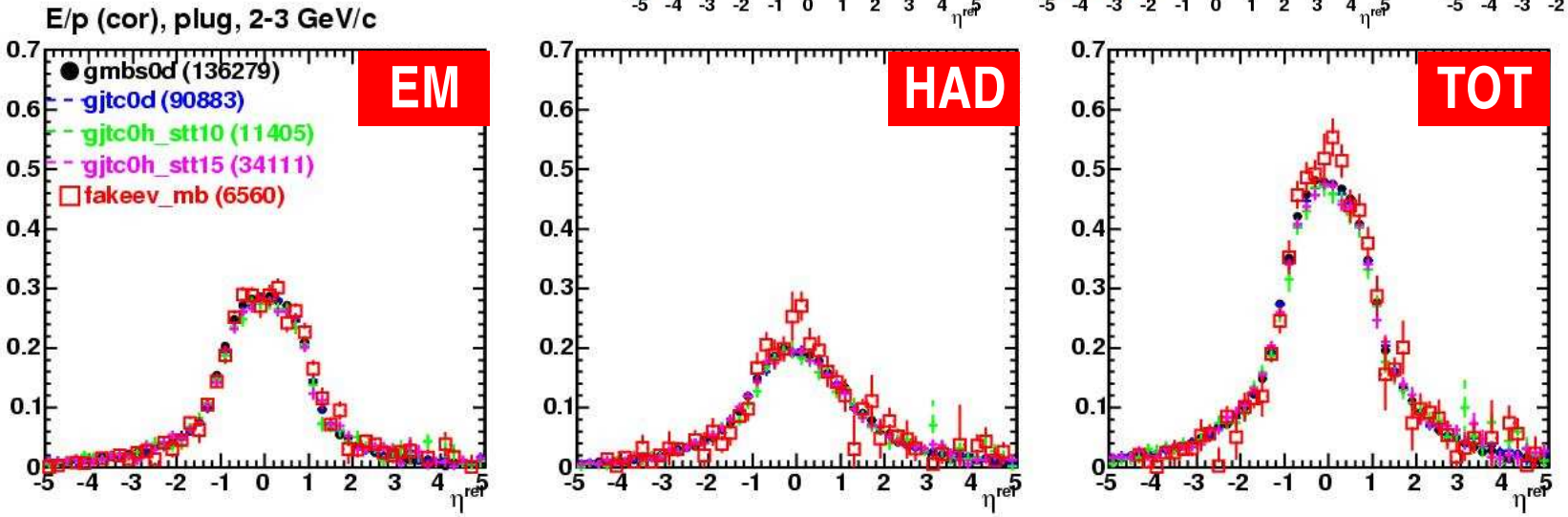


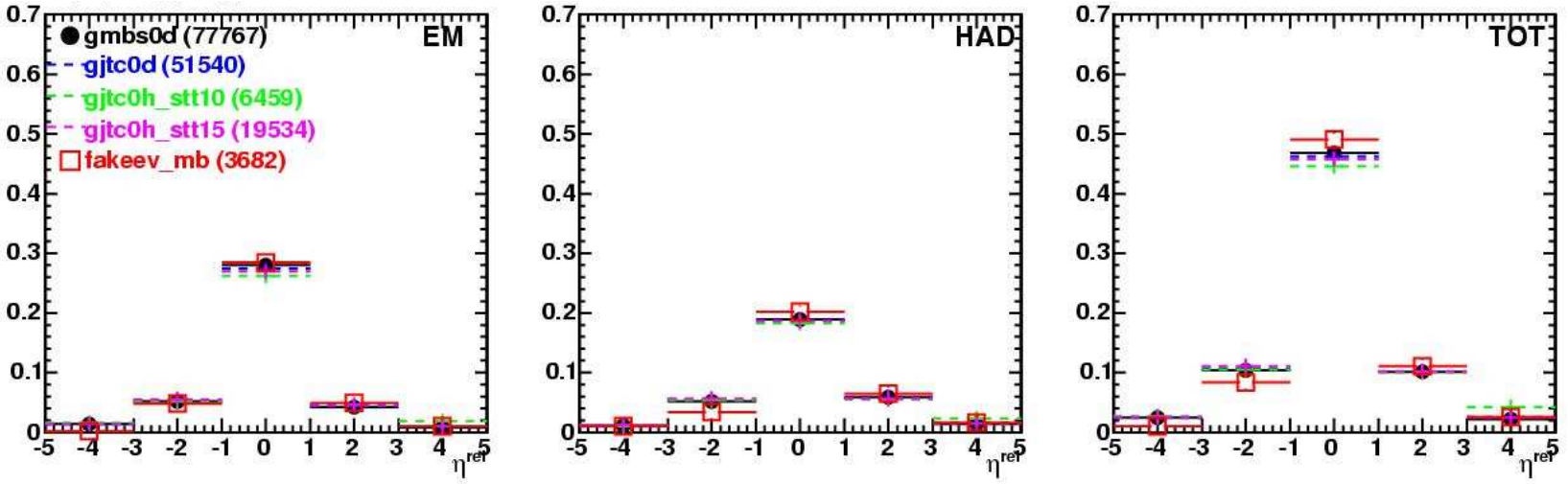




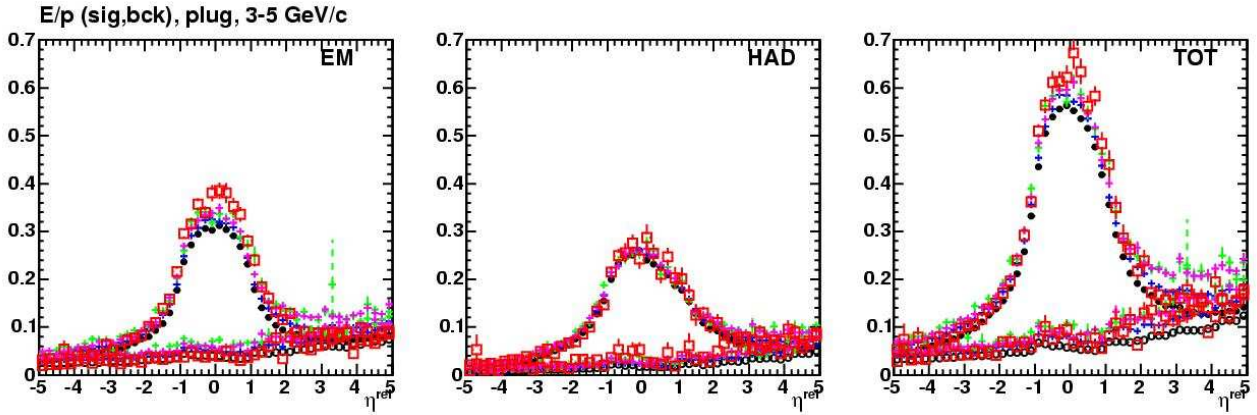
Plug (2-3 GeV/c)

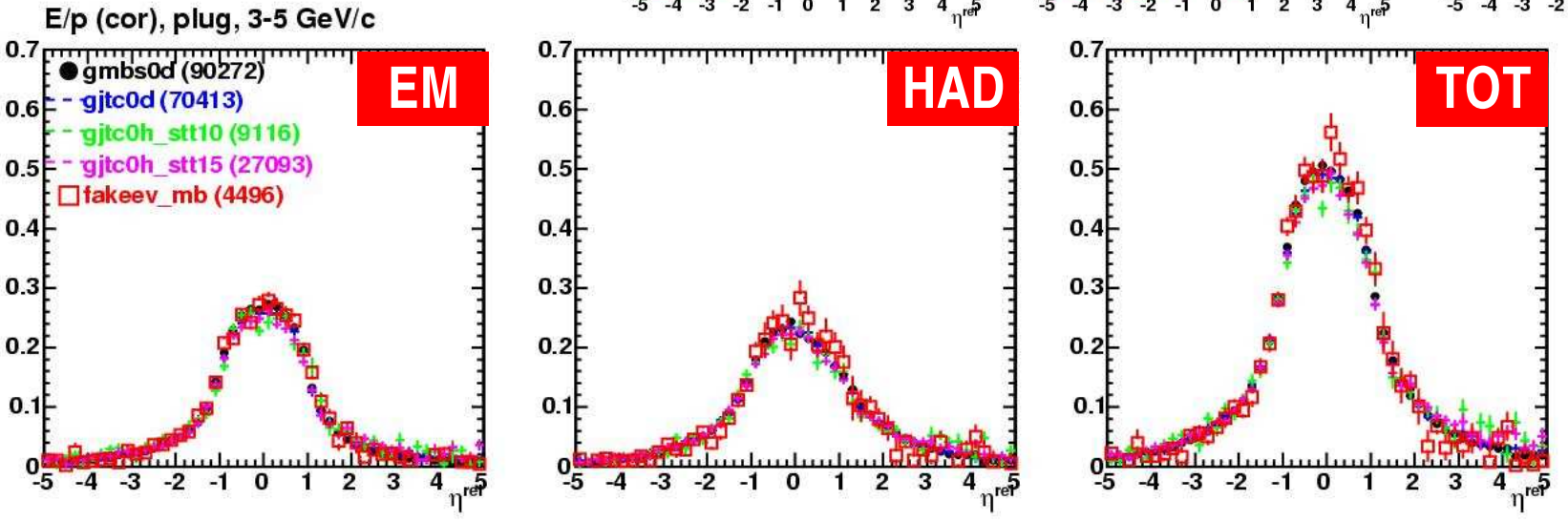

E/p (sig,bck), plug, 2-3 GeV/c
EM
HAD
TOT
η^{rel}

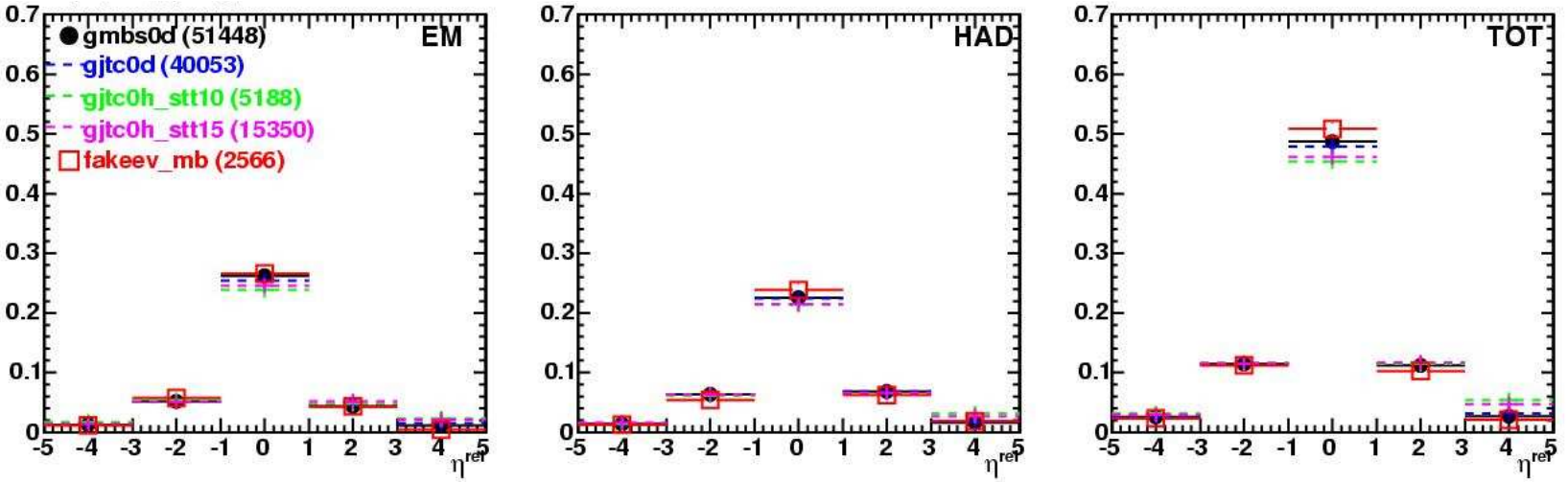

E/p (cor), plug, 2-3 GeV/c
gmbs0d (136279)
gjtc0d (90883)
gjtc0h_stt10 (11405)
gjtc0h_stt15 (34111)
fakeev_mb (6560)
EM
HAD
TOT
η^{rel}


gmbs0d (77767)
gjtc0d (51540)
gjtc0h_stt10 (6459)
gjtc0h_stt15 (19534)
fakeev_mb (3682)
EM
HAD
TOT
η^{rel}

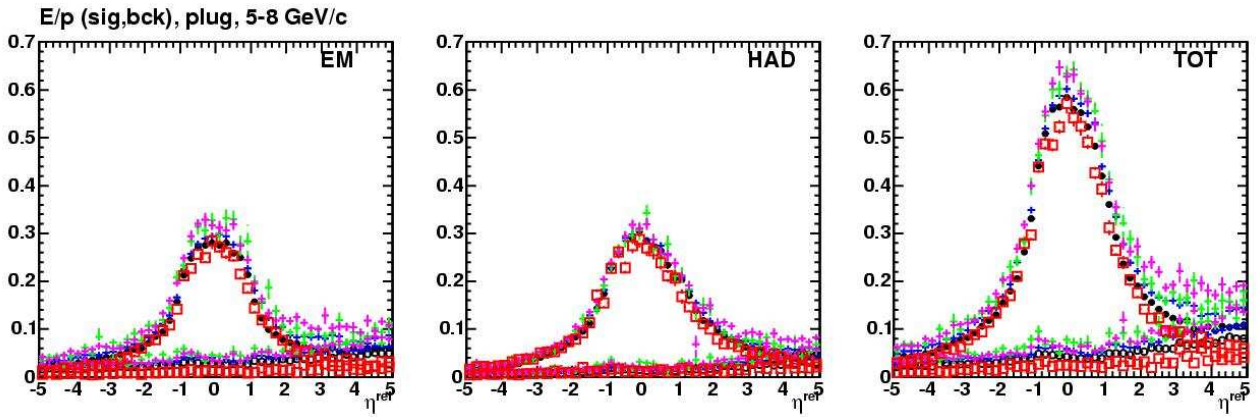
Plug (3-5 GeV/c)

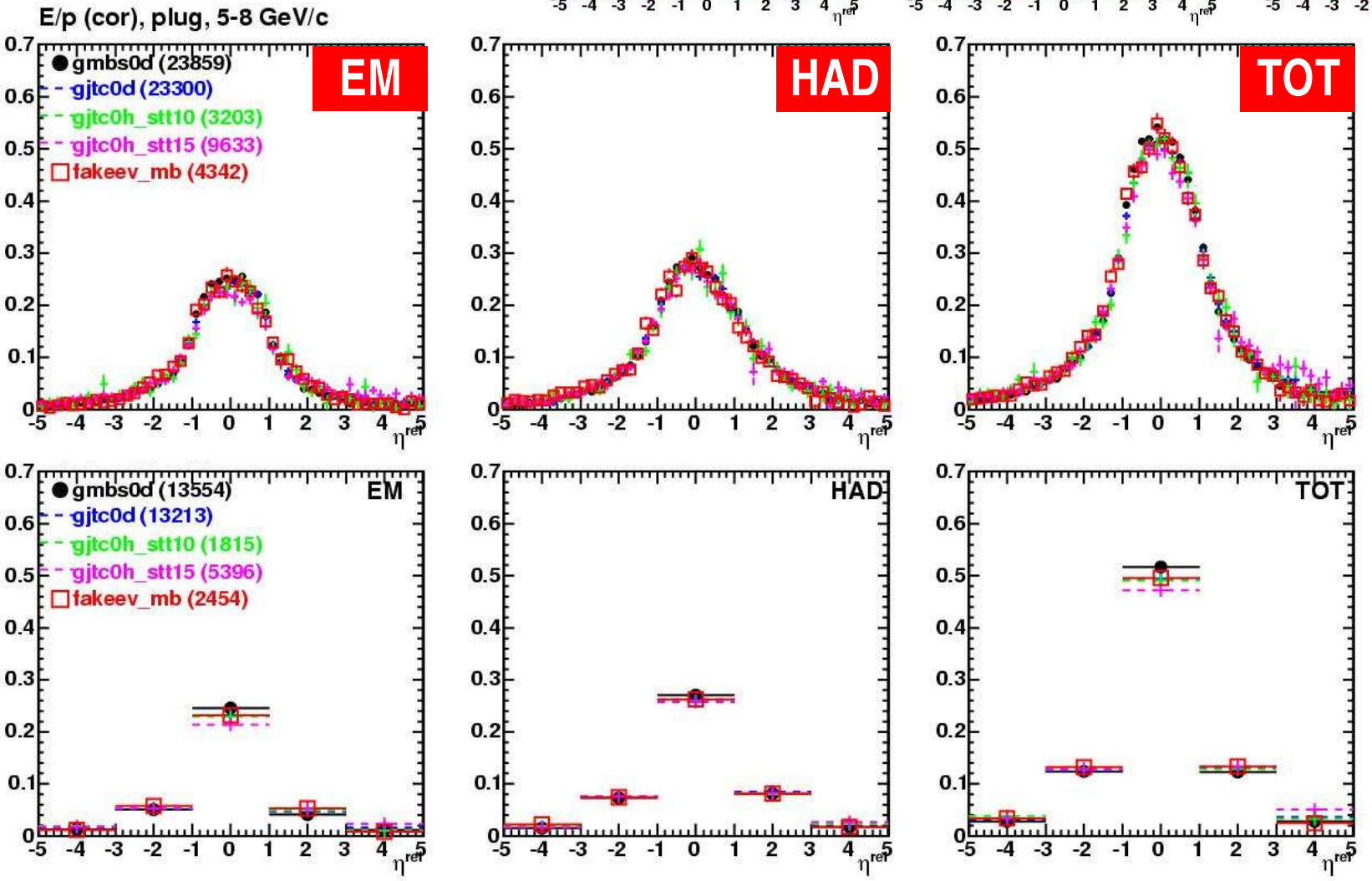

E/p (sig,bck), plug, 3-5 GeV/c
EM
HAD
TOT
η^{rel}


E/p (cor), plug, 3-5 GeV/c
gmbs0d (90272)
gjtc0d (70413)
gjtc0h_stt10 (9116)
gjtc0h_stt15 (27093)
fakeev_mb (4496)
EM
HAD
TOT
η^{rel}


gmbs0d (51448)
gjtc0d (40053)
gjtc0h_stt10 (5188)
gjtc0h_stt15 (15350)
fakeev_mb (2566)
EM
HAD
TOT
η^{rel}

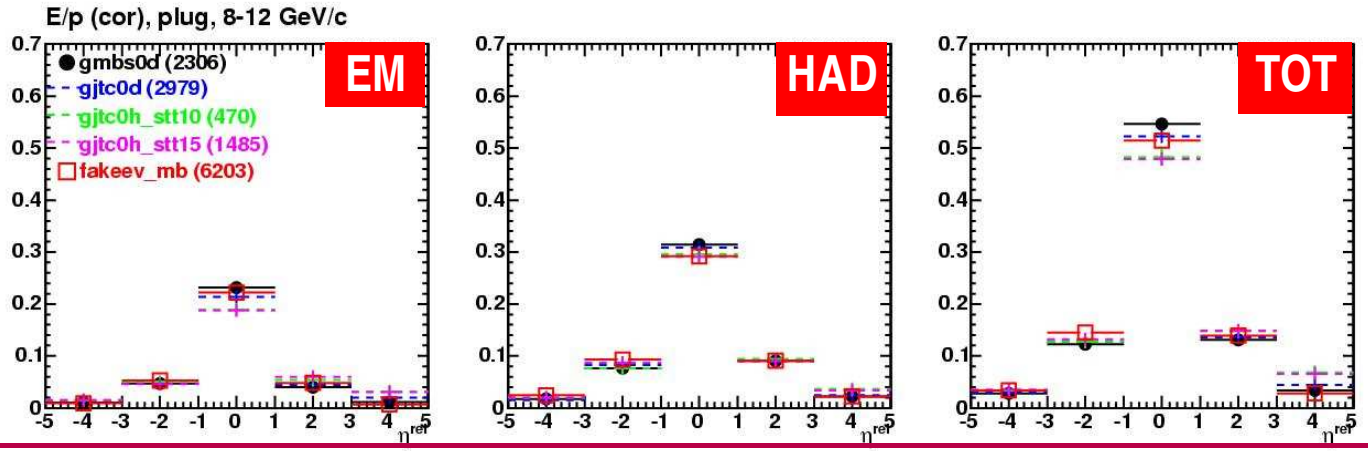
Plug (5-8 GeV/c)


E/p (sig,bck), plug, 5-8 GeV/c
EM
HAD
TOT

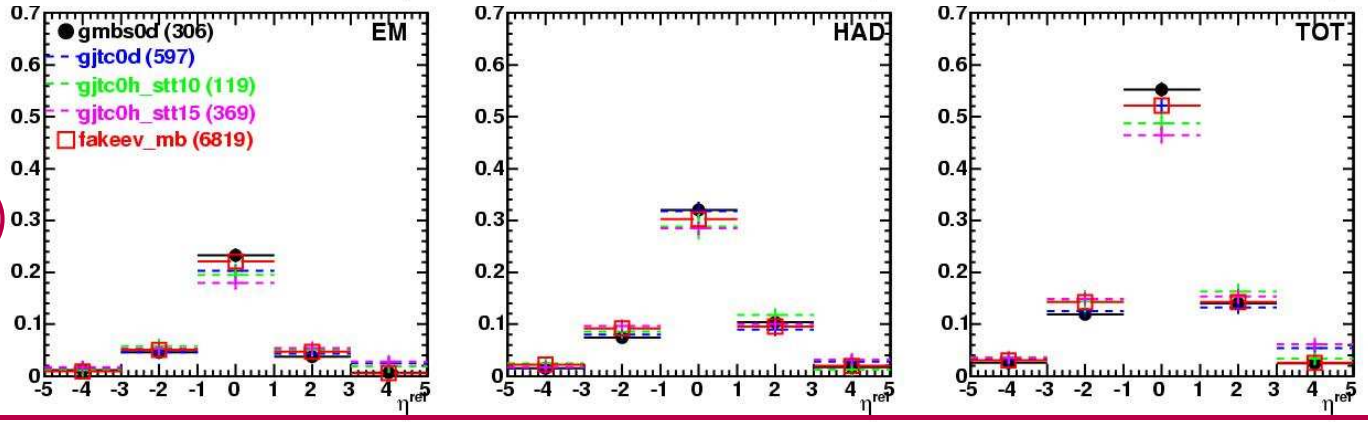

E/p (cor), plug, 5-8 GeV/c
EM
HAD
TOT
gmbs0d (23859)
gjtc0d (23300)
gjtc0h_stt10 (3203)
gjtc0h_stt15 (9633)
fakeev_mb (4342)
gmbs0d (13554)
gjtc0d (13213)
gjtc0h_stt10 (1815)
gjtc0h_stt15 (5396)
fakeev_mb (2454)

Plug

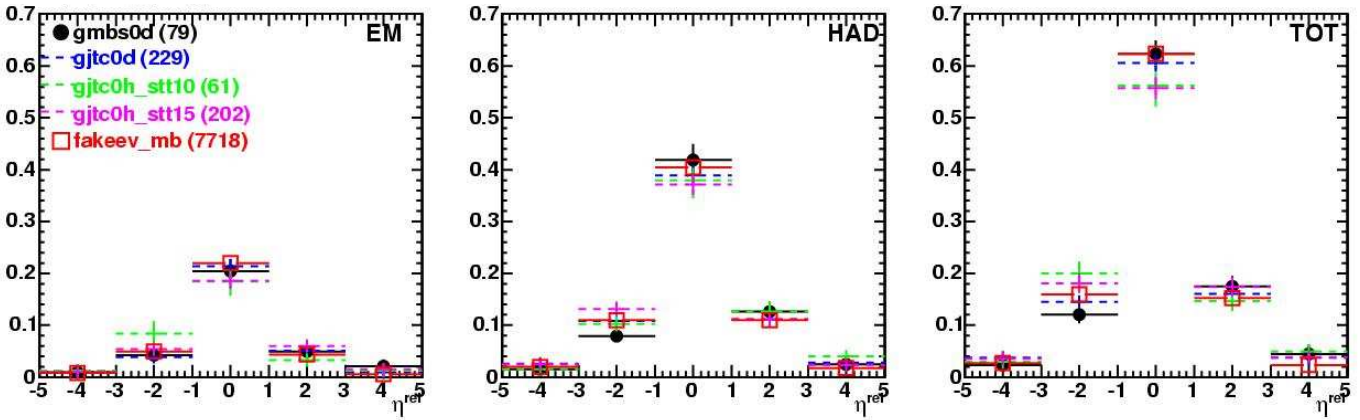
(8-12 GeV/c)



(12-16 GeV/c)



(16-24 GeV/c)



Conclusions

- The new simulated profiles with Gflash parameters optimized in the Central region generally fit better the normalized E/p profiles measured in Crack and Plug at particle momenta = 0.5 to 24 GeV/c.
  For comparison with the previous situation in Plug region, see e.g.
  - my SGM talk of July 20th 2005, pp 31-33
  - my SGM talk of Oct 20th 2005, pp 20-21
- However, the parameter values seem still seem to be still suboptimal:
  - at low p, the profiles appear too narrow
  - at high p, the profiles are slightly to broad
- This observation is consistent with my previous findings that the (prelimary) Plug tuning actually requires a smaller core value R_1 at high p and a larger spread term Q at low p.
- It might be useful to have a separate Plug parametrization.