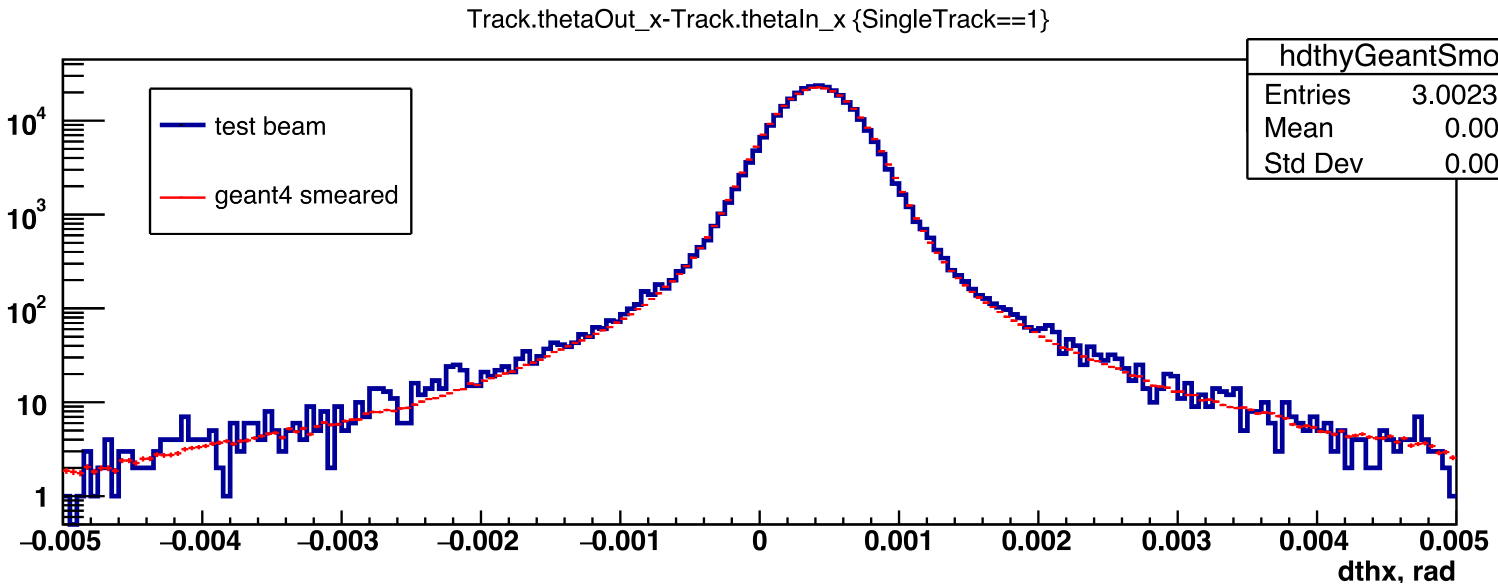
TB analysis

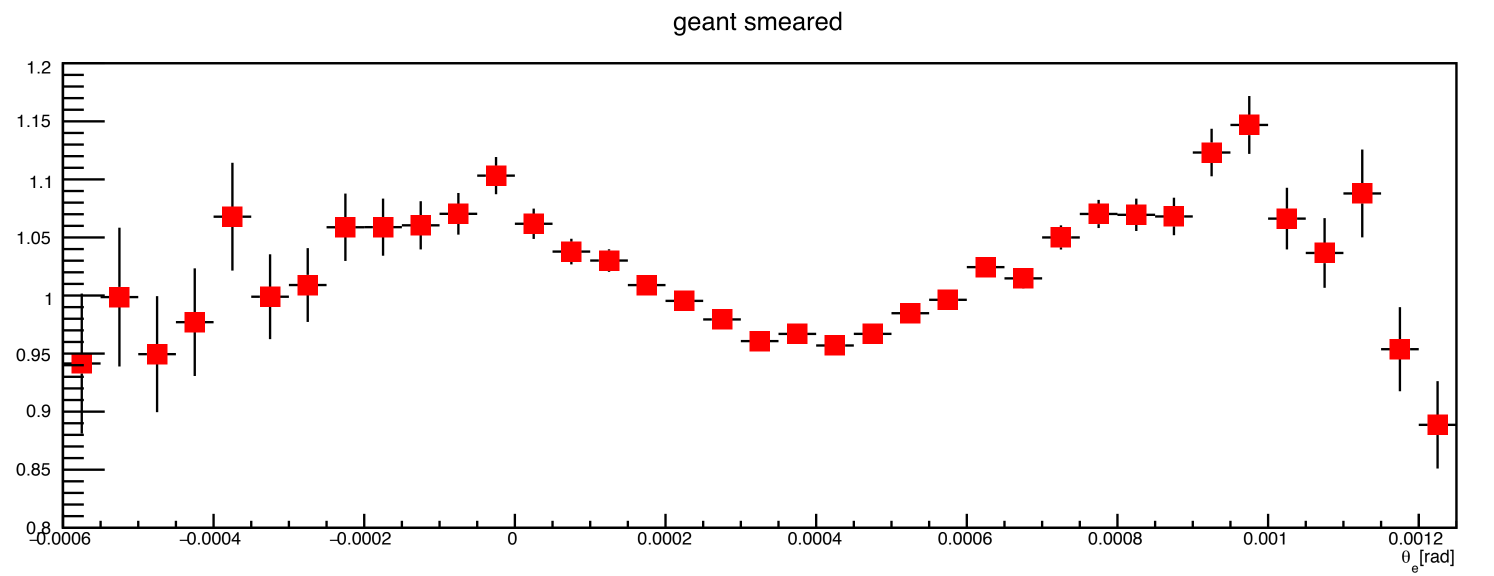
F. Ignatov, G. Venanzoni

- Comparison of data with Geant “convoluted”
- Fit
- Comparison of geant 10.4 default with opt4

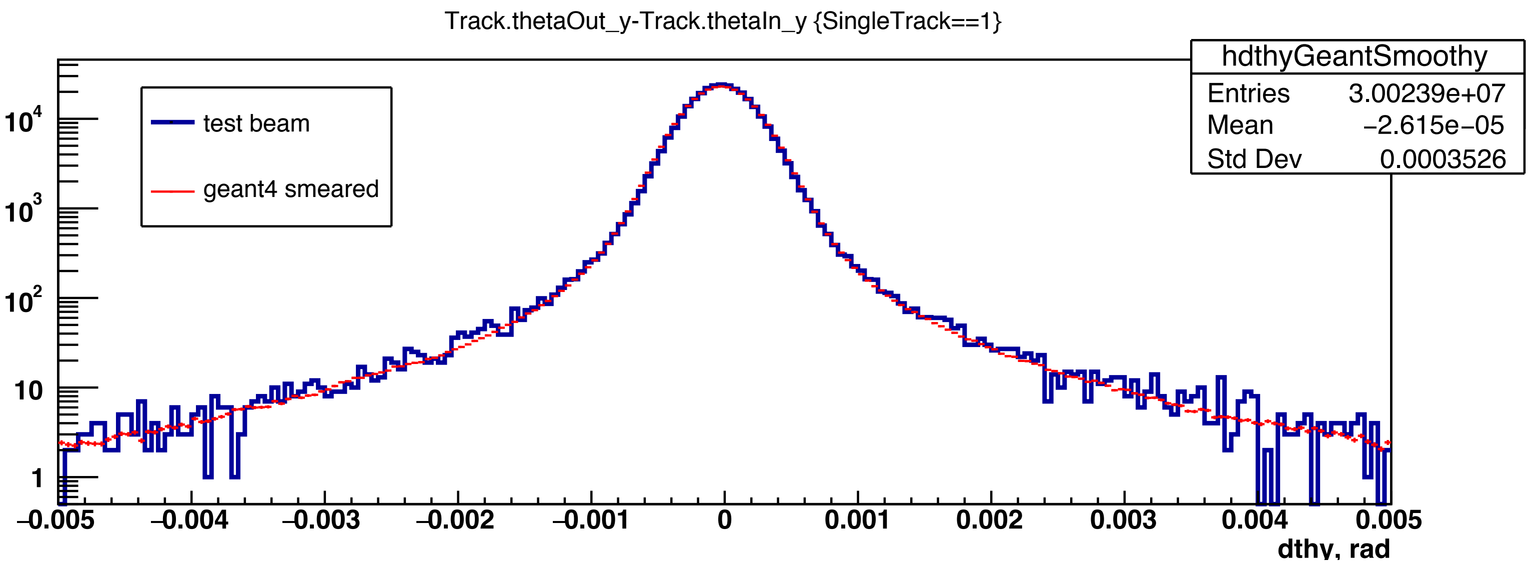
- Sample:
  - Data: $3x10^5$ evts of e- @12 GeV (run 5348)
  - MC "convoluted"=T⊗A
  - T=10^7 evts of e- @12 GeV impinging in normal direction on 8mm C (graphene) simulated with geant 10.4 (two different options: default and opt4)
  - A=Apparatus with No target= : $3x10^5$ evts of e- @12 GeV (run 5349)
- Cautious:
  - We used the first reconstructed data sample with limited statistics and preliminary alignement/reconstruction
  - Method is biased since neglects e- which arrives to (or emerges from) Target with lower energy/different angle due to energy loss/Multiple Scattering before (or after) the target

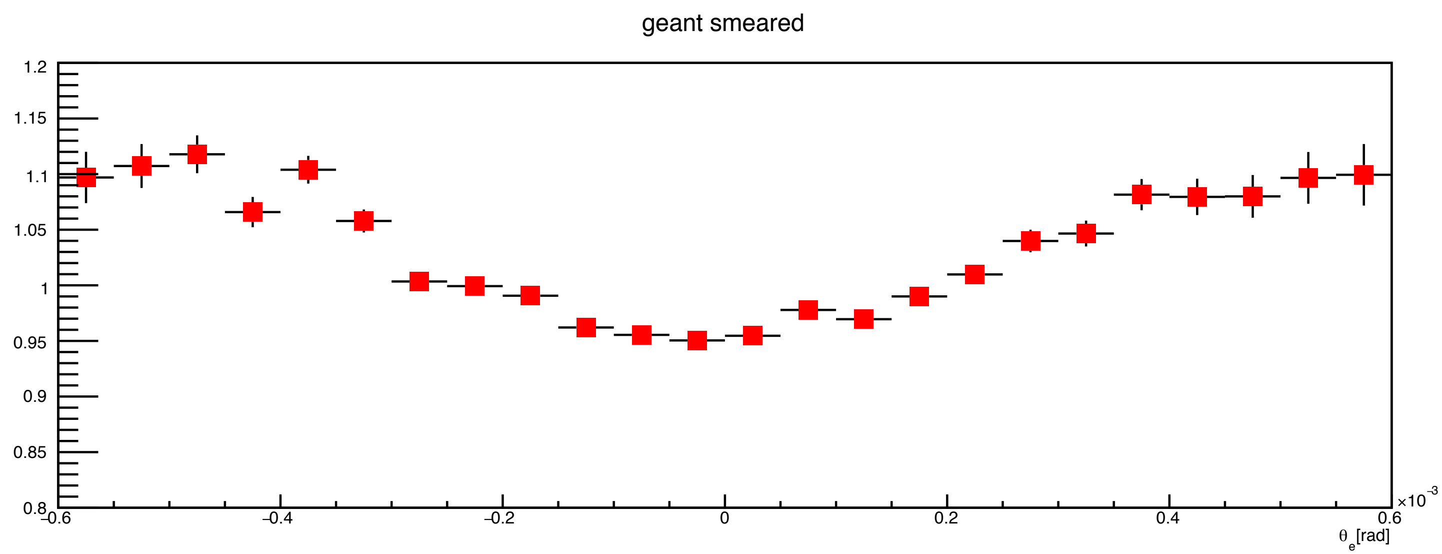
Comparison TB vs Geant convoluted



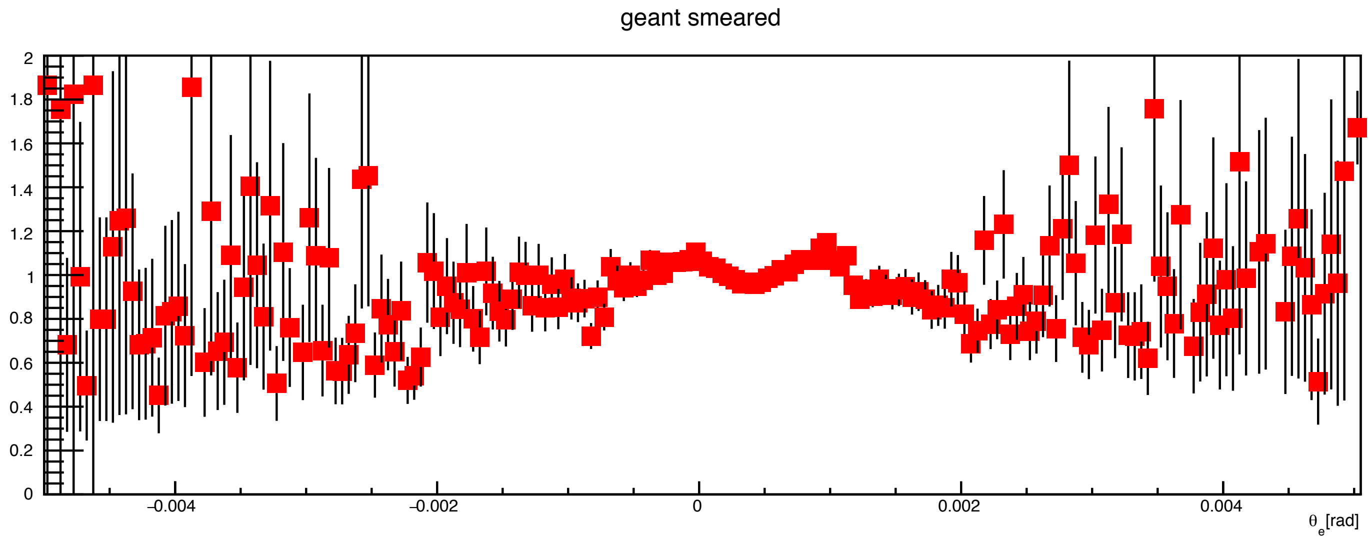


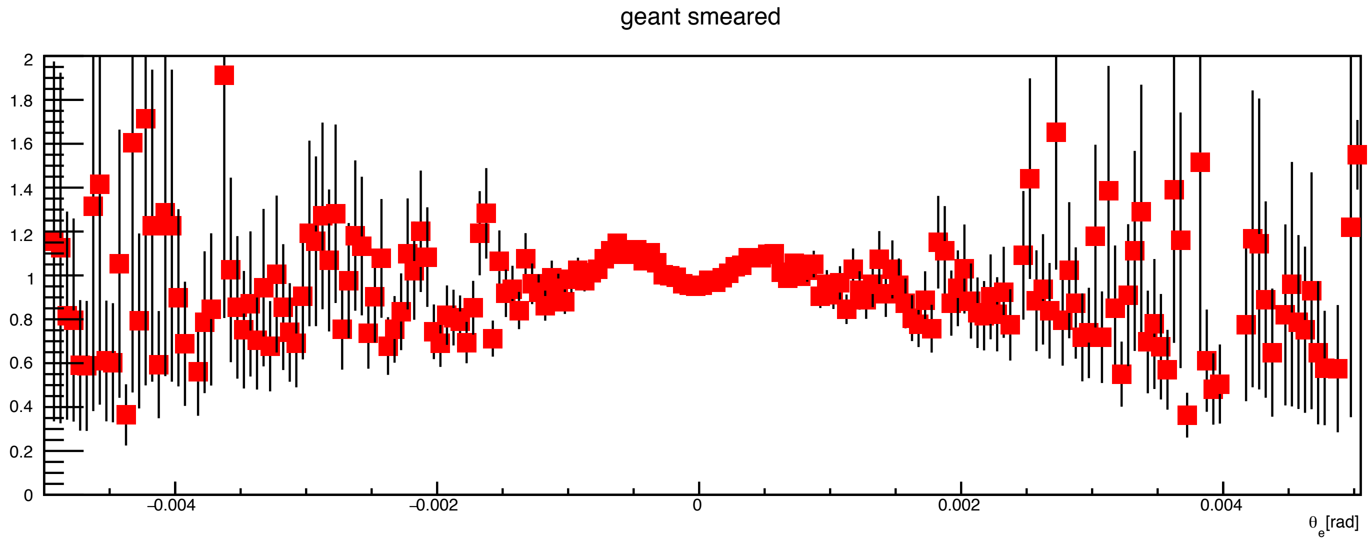
Comparison TB vs Geant convoluted





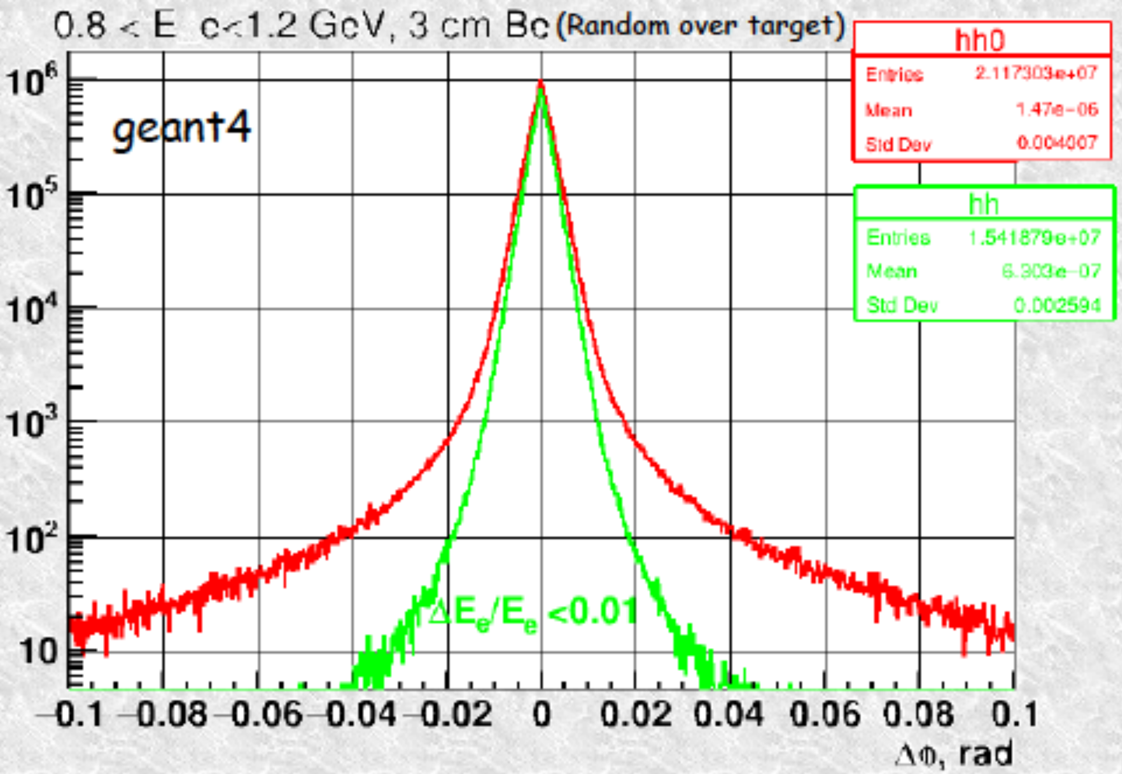
Comparison TB vs Geant convoluted





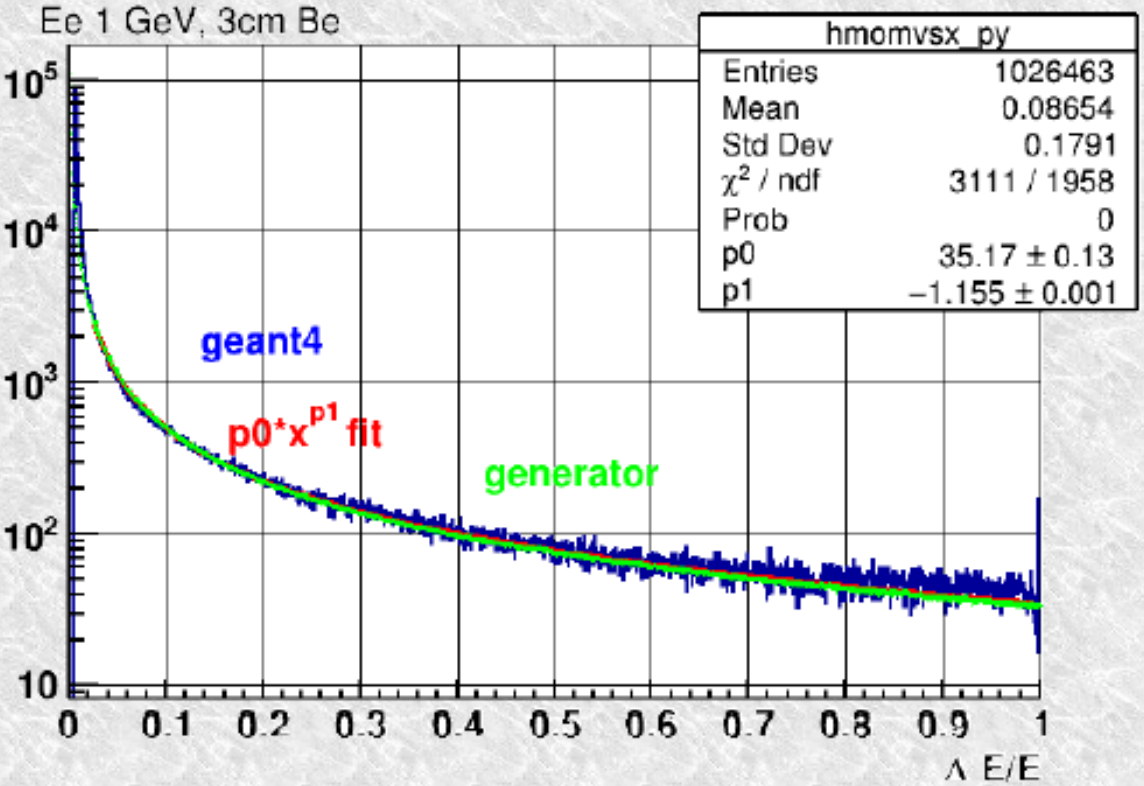
Fedor's model for MS

MS tails comes after electron energy loss (bremsstrahlung):



If it is no energy loss
→ it is mostly no tails

Bremsstrahlung parametrization



Well parametrized by power dependence:
$f(\Delta E)dE = p0\ (\Delta E)^{p1}\ dE$

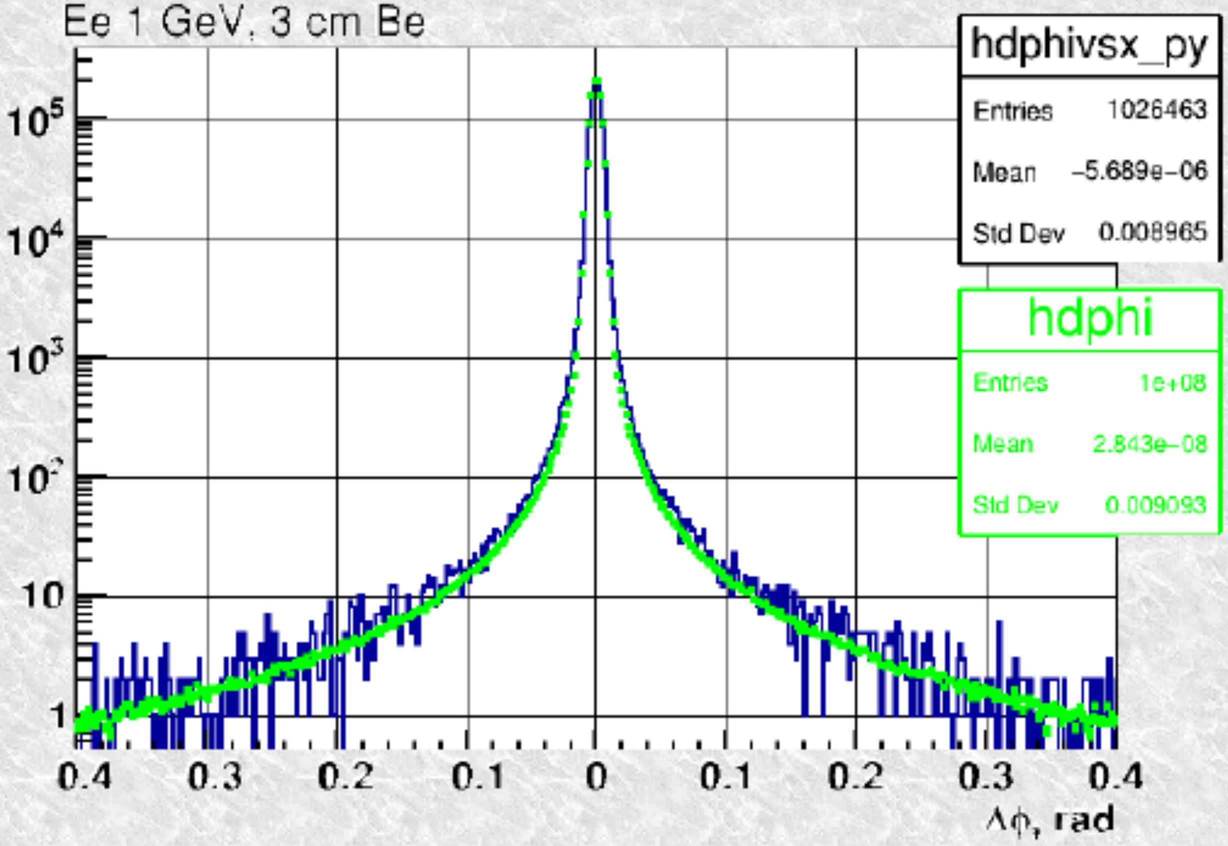
P0 = 0.068494 after 3cm Be,
- proportional to X/X0, does not depend on E_0

P1=-1.-0.18 - constant over X/X0 and E_0

$\Delta E_{min}/E_0 = (1-(p1+1)/p0)^{1/(1+p1)}$

MS tails

Geant4 vs simple model



Bremsstrahlung + additional MS of lower momentum electron are perfectly describe MS tails

RMS is also well consistent

Fit function

- $F=p[0]*(1-p[8])*fbrem\otimes f_{MS}+p[8]*f_{TAIL}$
- fbrem=fbrem(p[5],p[6],p[7])
- fMS= p[0]*((1 -p[3])*TMath::Gaus(x0,xm,sigthe0,true)
  +p[3]*TMath::Gaus(x0,xm,sigthe0_2,true))
- f_{TAIL}=+p[8]*TMath::Gaus(x0,xm,p[9],true))

x0=p[0]

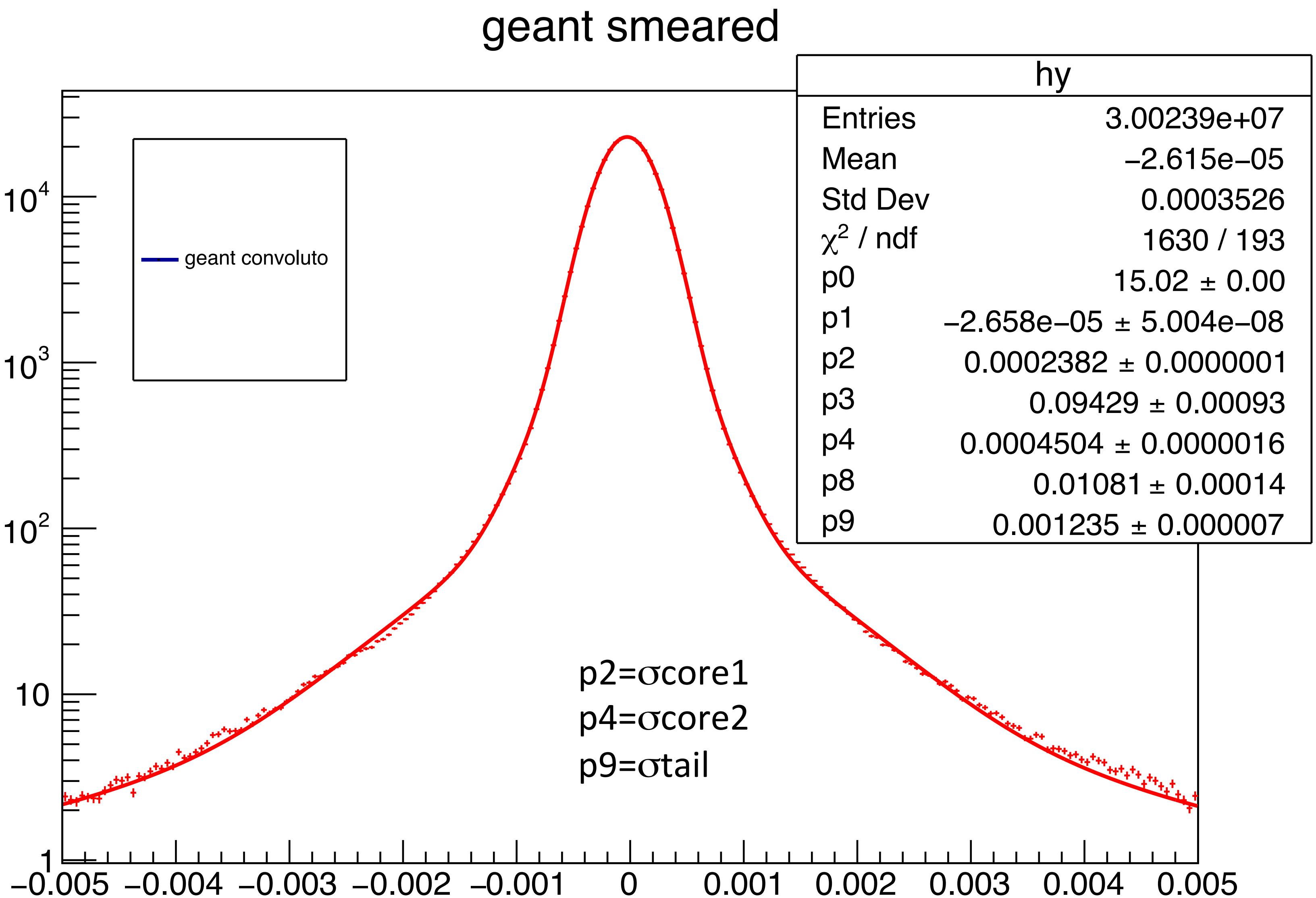
xm=p[1]

sigthe0=p[2]

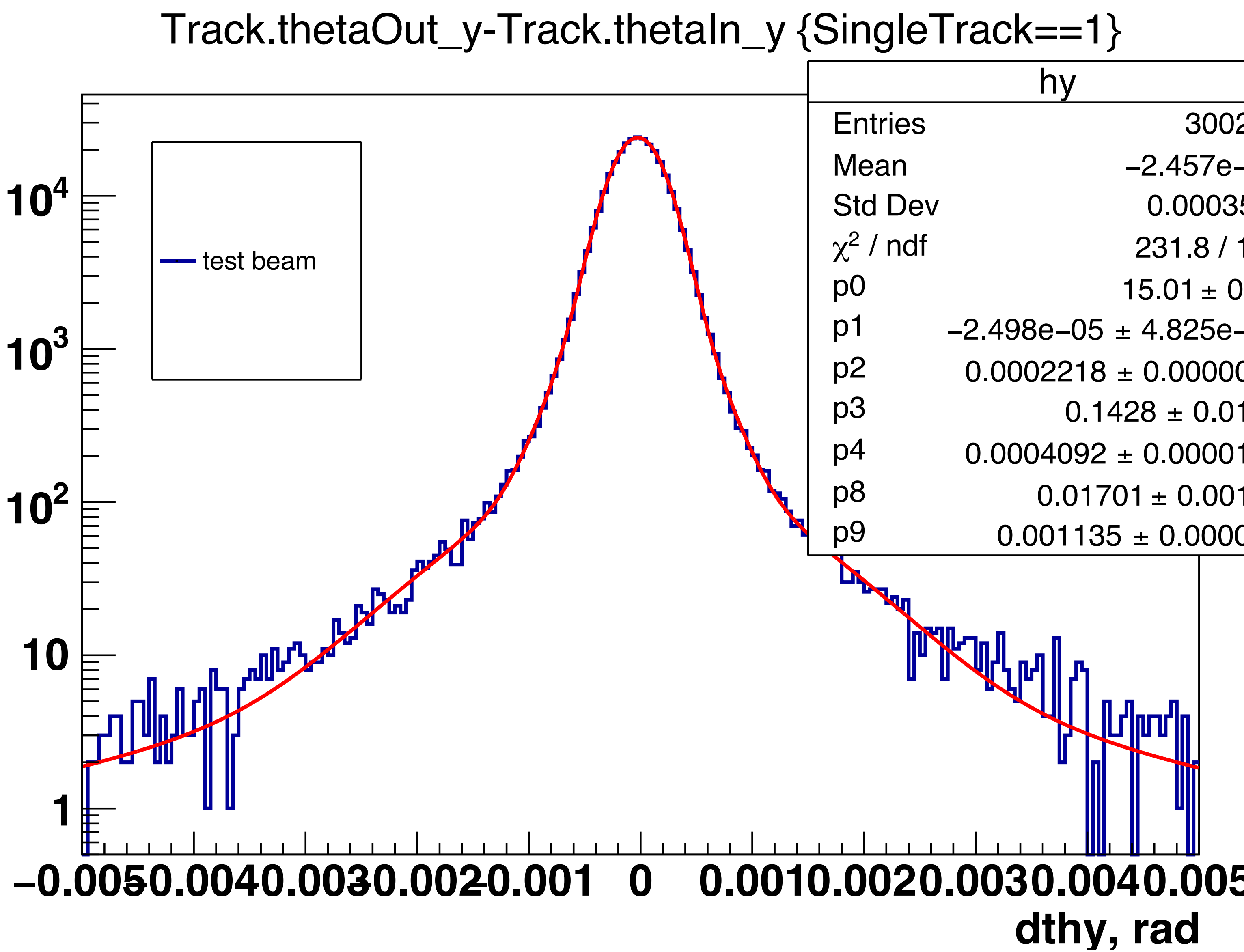
sigthe0_2=p[4]

$sigma_{tail}$=p[9]

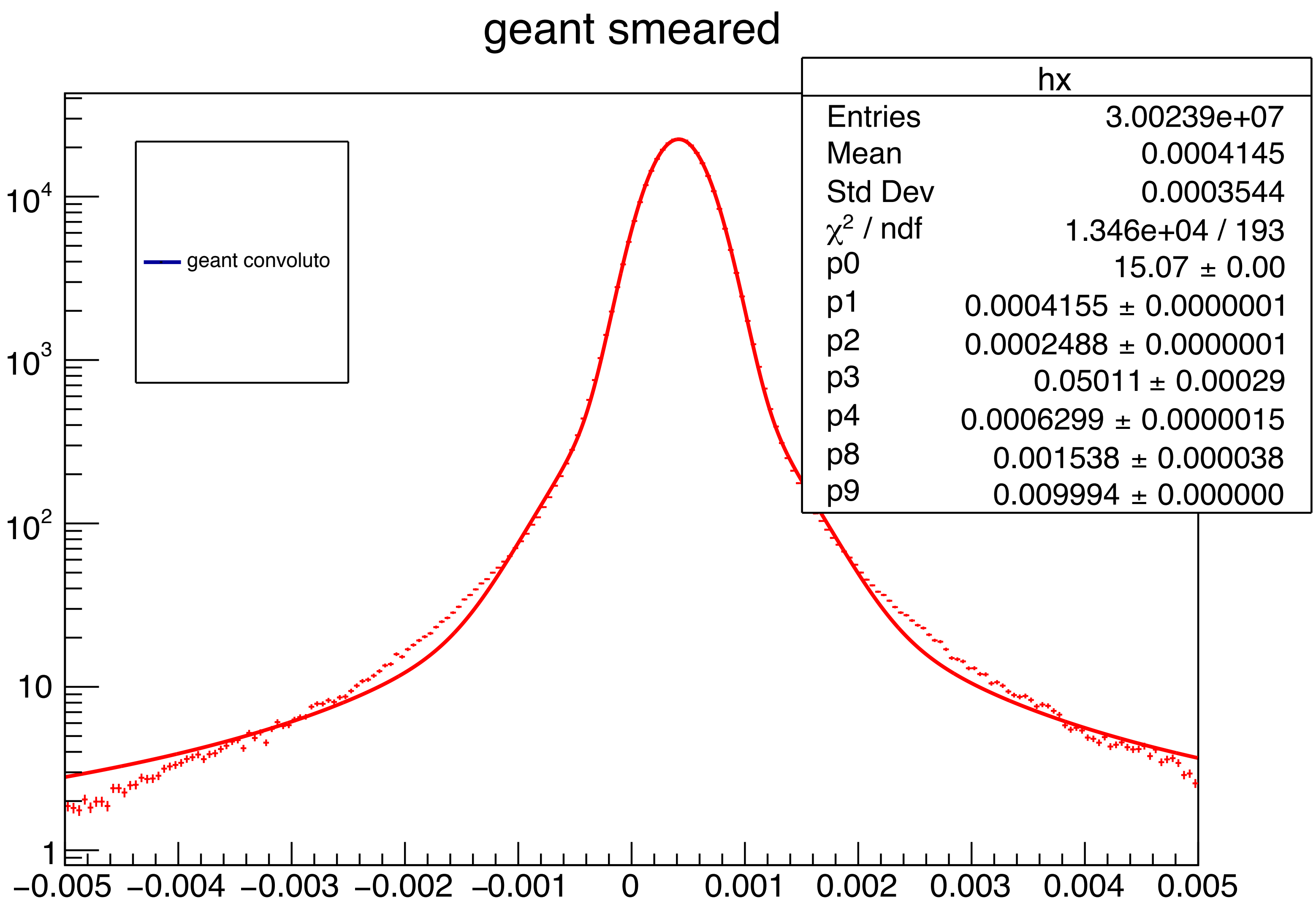
Fedor’s FIT: GEANT



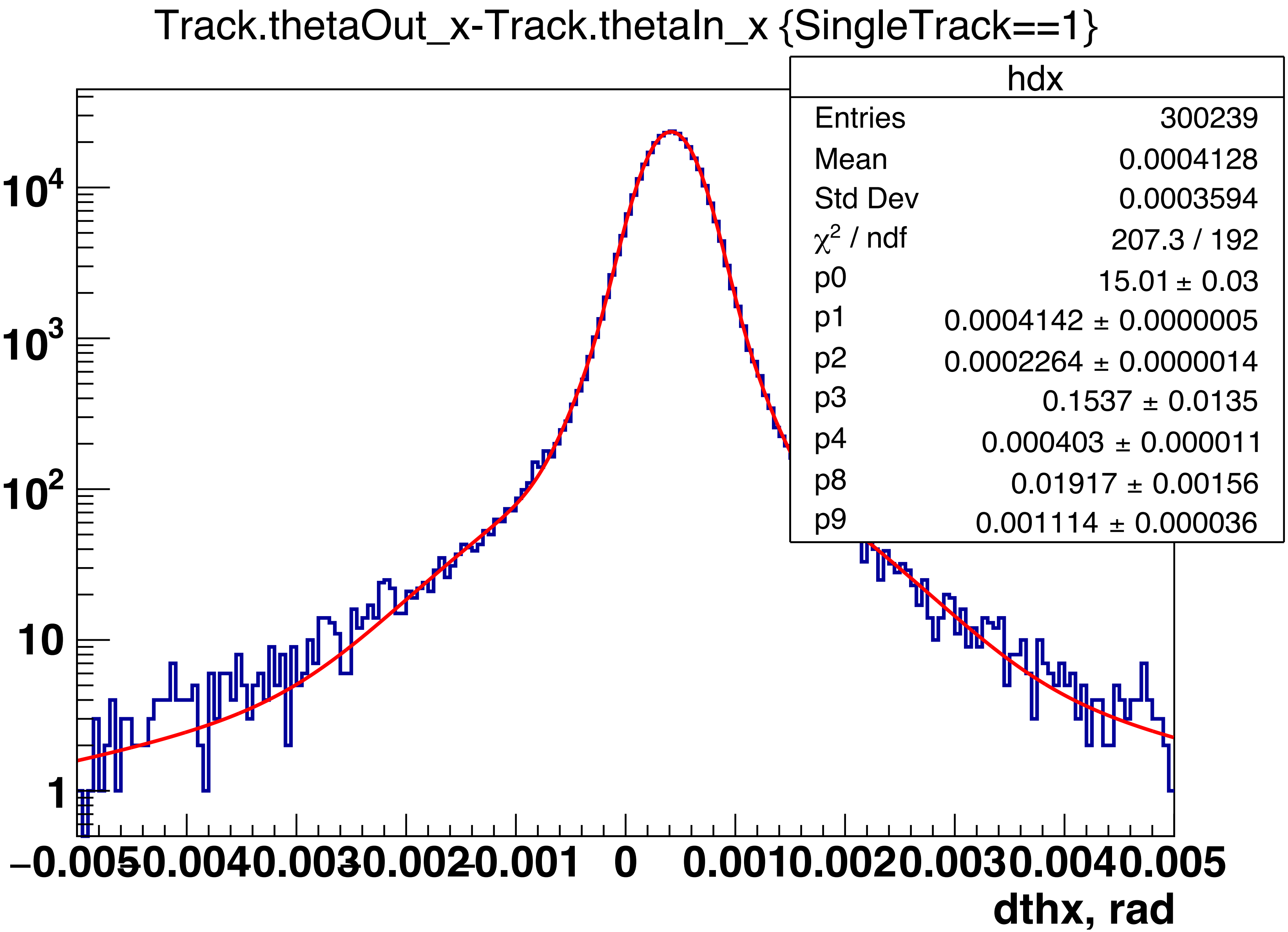
Fedor’s FIT: data



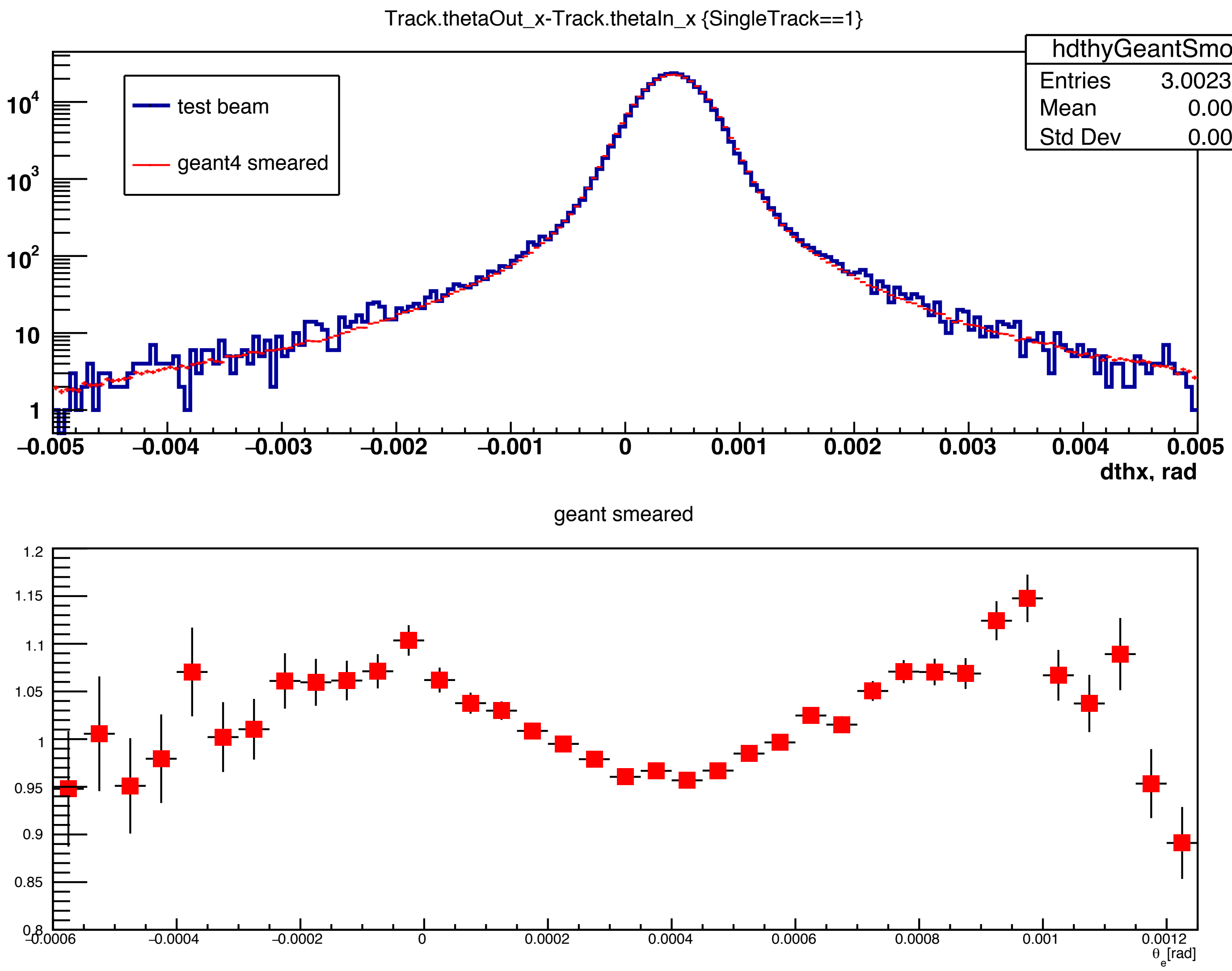
Fedor's FIT: GEANT



Fedor’s FIT: data



Comparison TB vs Geant opt4



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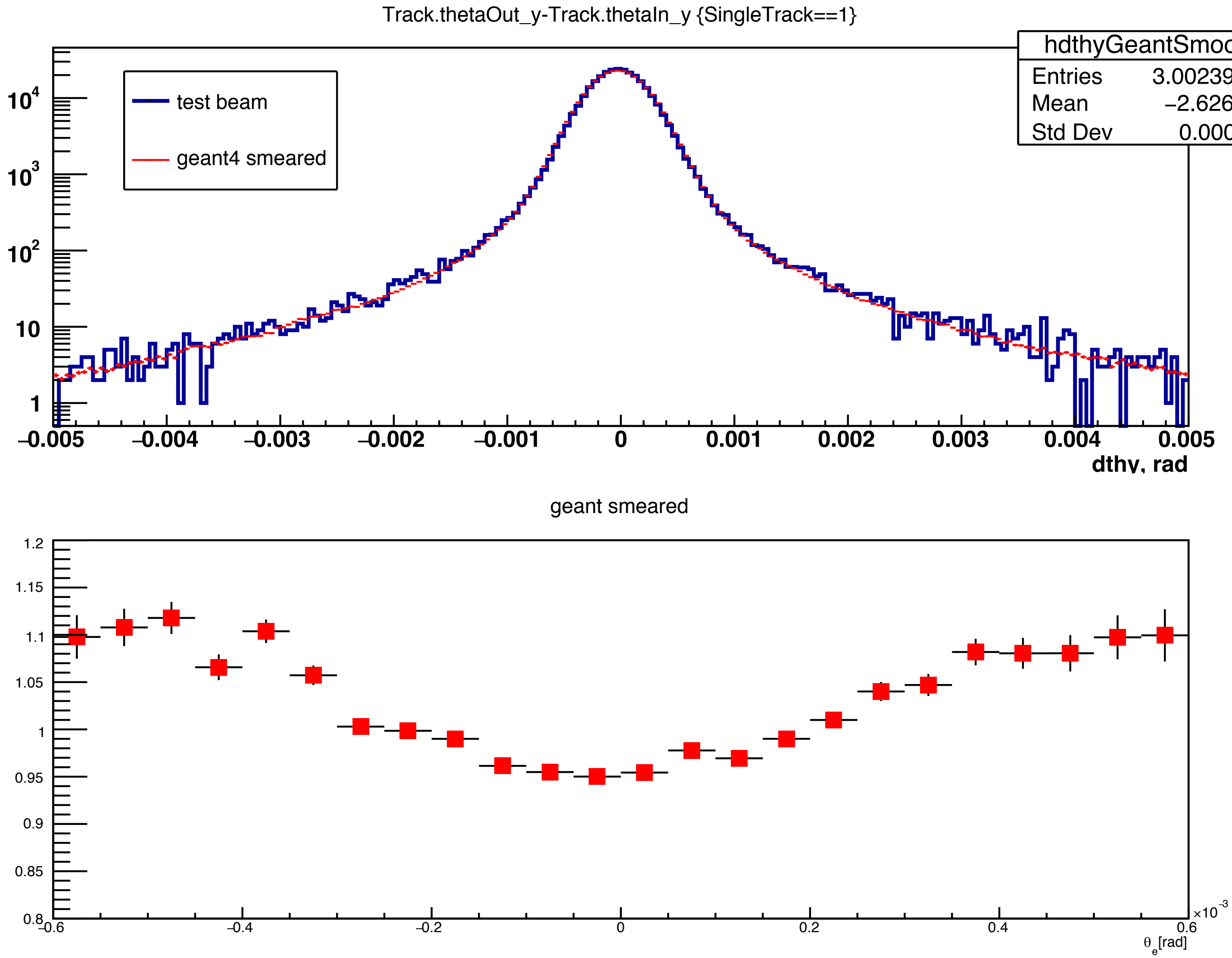
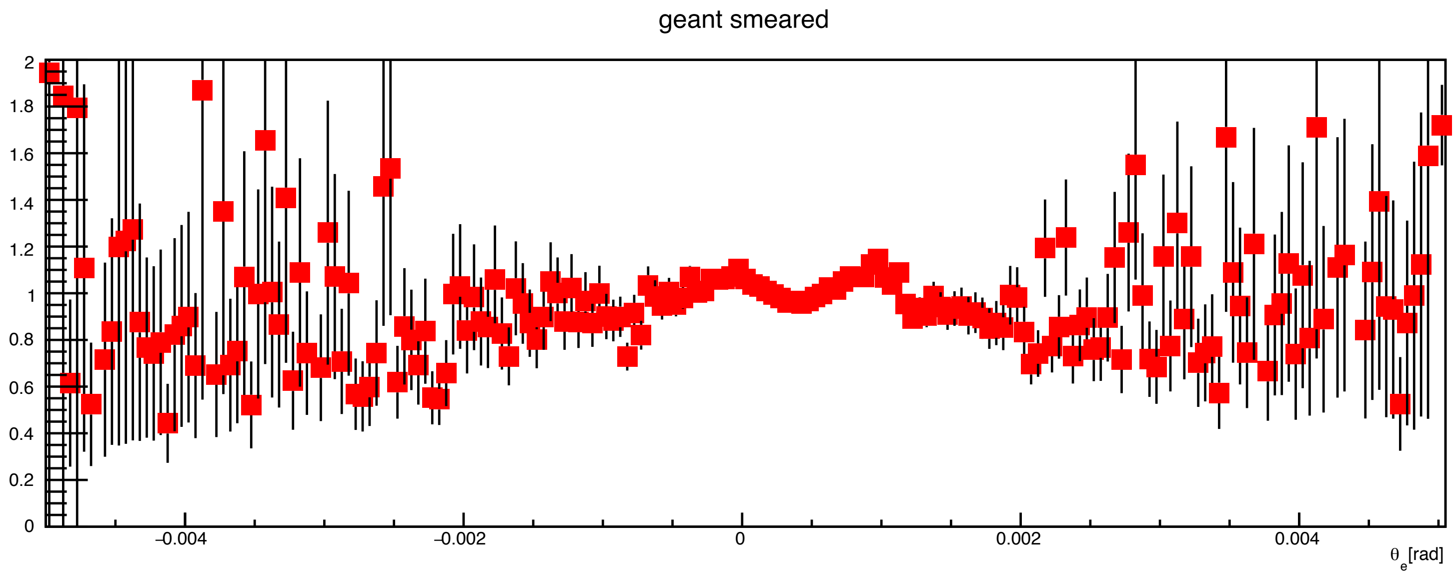
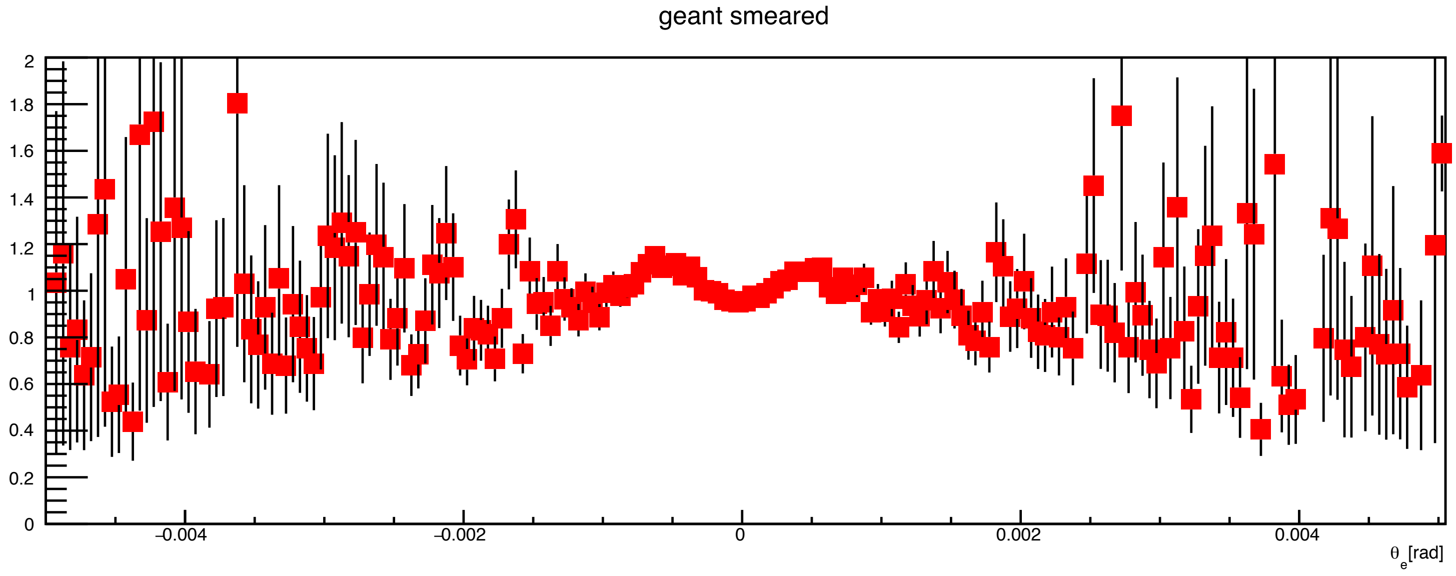
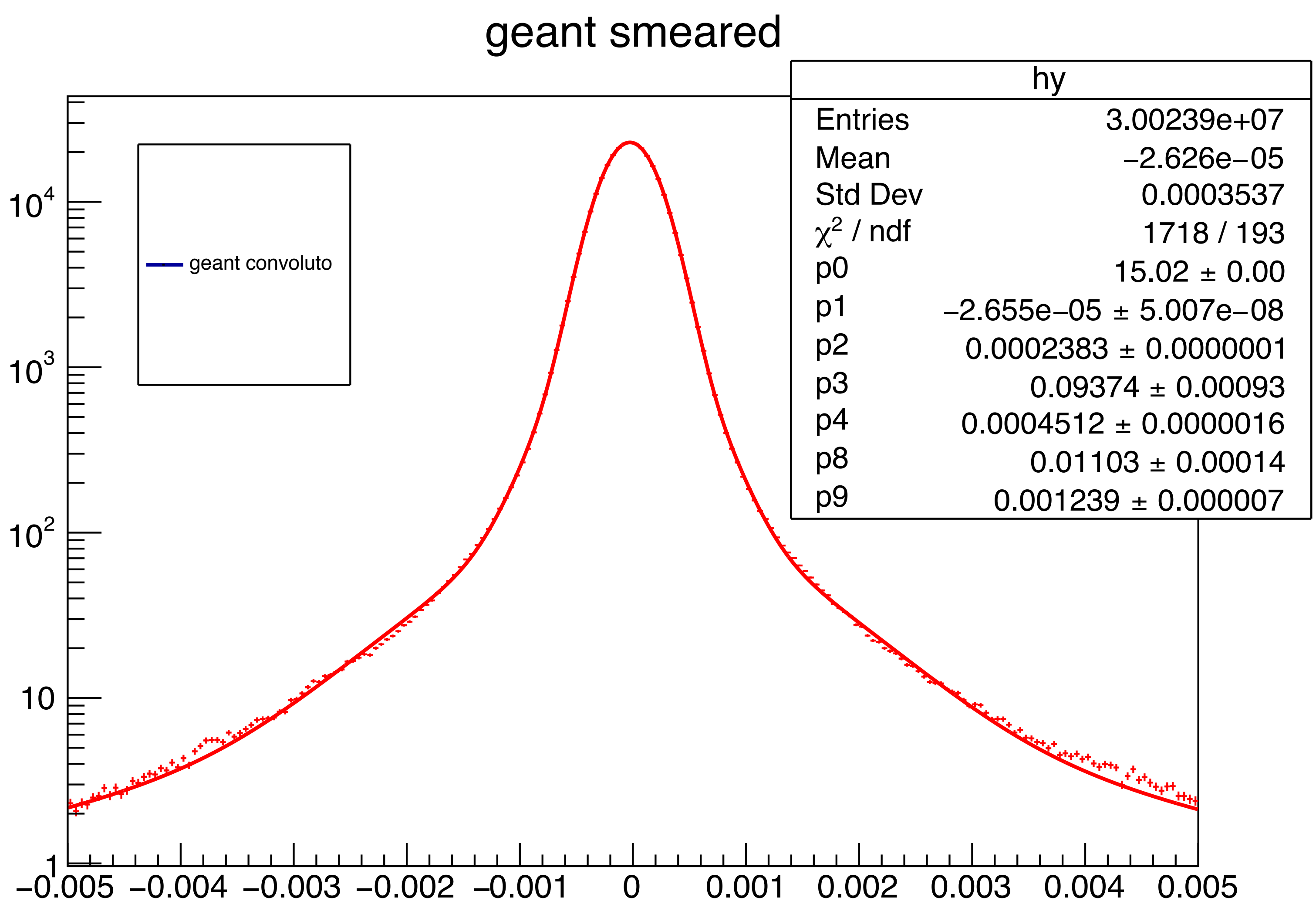


Comparison TB vs Geant opt4





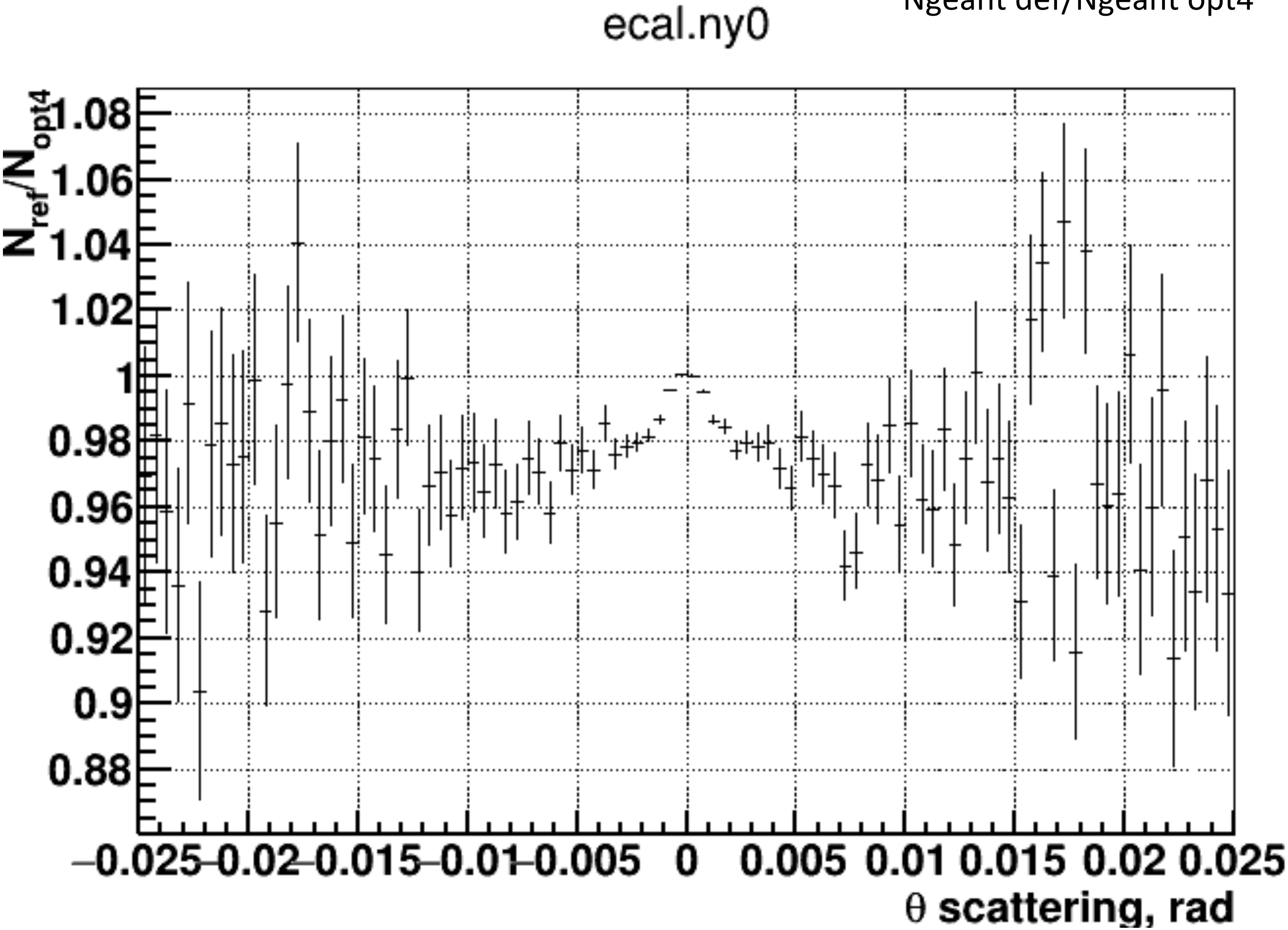
Fedor’s FIT: GEANT opt4



Results

Sample	σcore1 (10^{-4})	σcore2 (10^{-4})	σtail (10^{-3})	Comment
Theta_y d	2.22	4.09	1.13	
Theta_y MC	2.38	4.5	1.23	ref
Theta_y MC opt4	2.38	4.51	1.24	opt4
Difference	**7%**	**10%**	**9%**	
Theta_x d	2.26	4.03	1.11	
Theta_x MC	2.49	5.0	1.00	Fit is poor
Difference	**10%**	**25%**	**11%**	

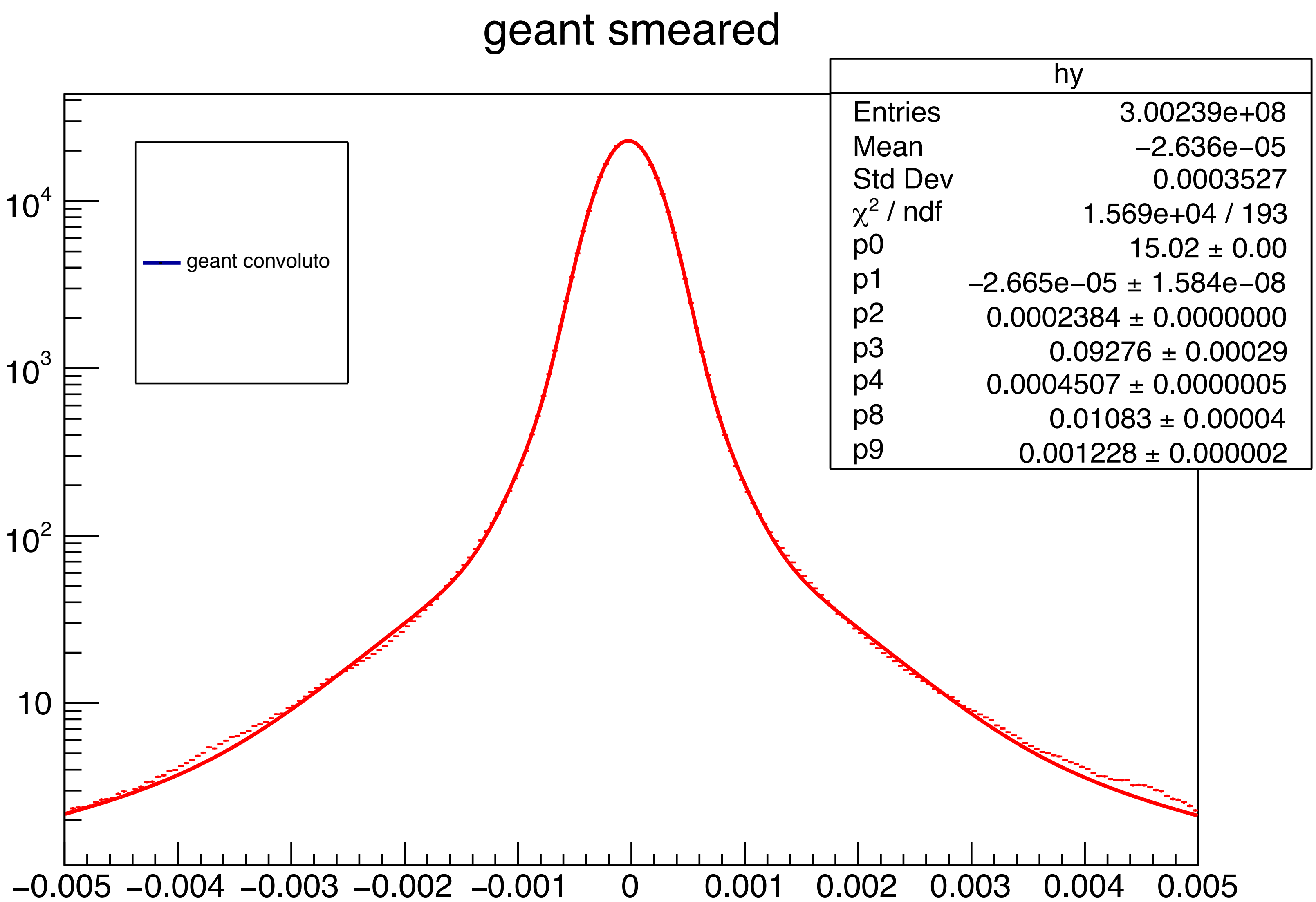
Ngeant def/Ngeant opt4



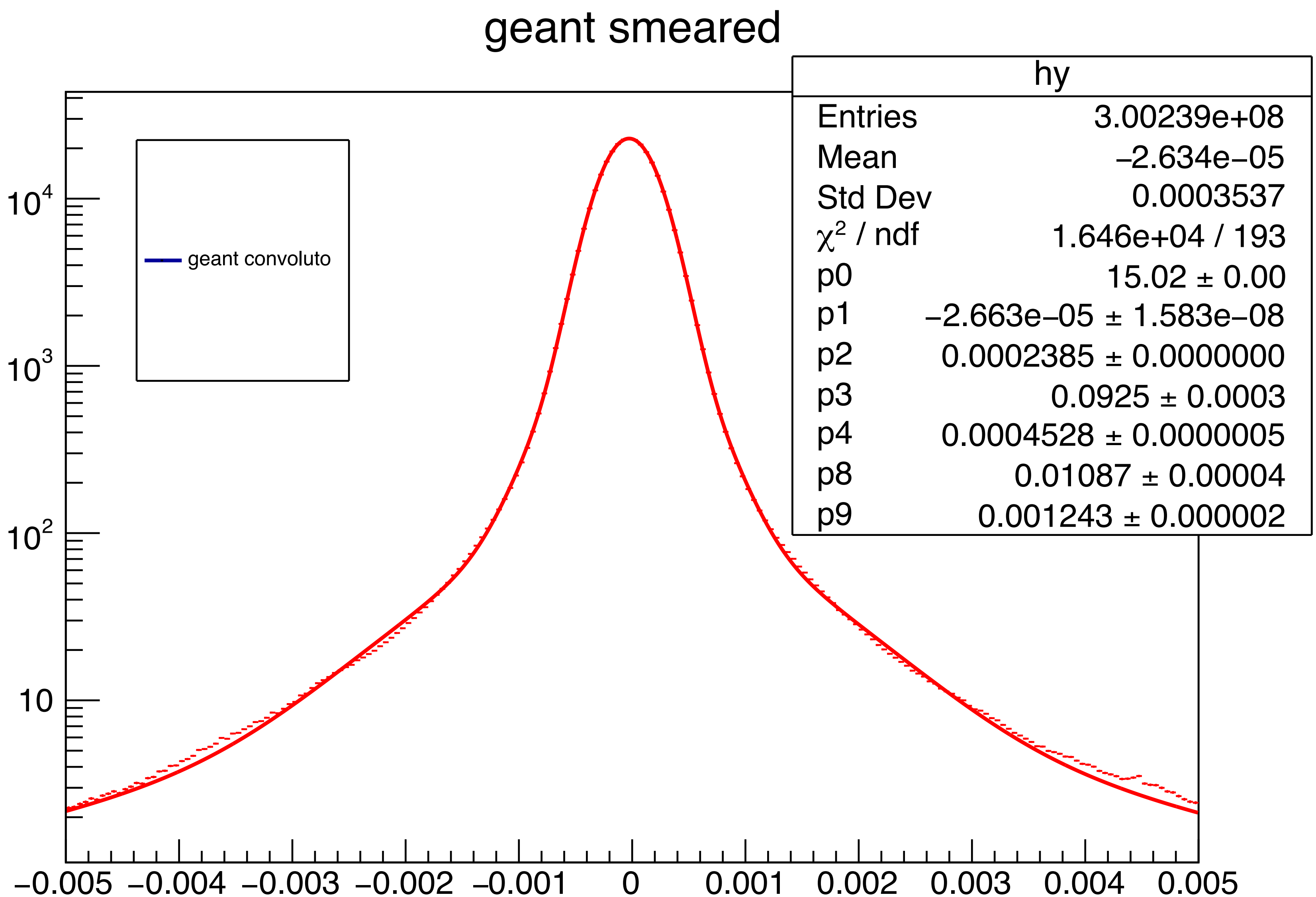
Conclusions

- Analysis of 12 GeV e- on 8 mm C
- MS distribution modeled with a convolution of a bremmstrahlung function x MS(2 gaussians)+third gaussian
- Differences at the level of 7-10% on the sigma of the two gaussians and tails between data and MC
- Better agreement on theta_y respect to theta_x
- Difference between standard geant 10.4 (default) and opt option is only in p(9) of ~1% (the other parameters are the same)
- Data is statistical limited and first reconstruction
- Method is biased (must be corrected)
- Work is in progress to use the whole data sample and analyse more recent runs

GEANT thy 5e8 evtns

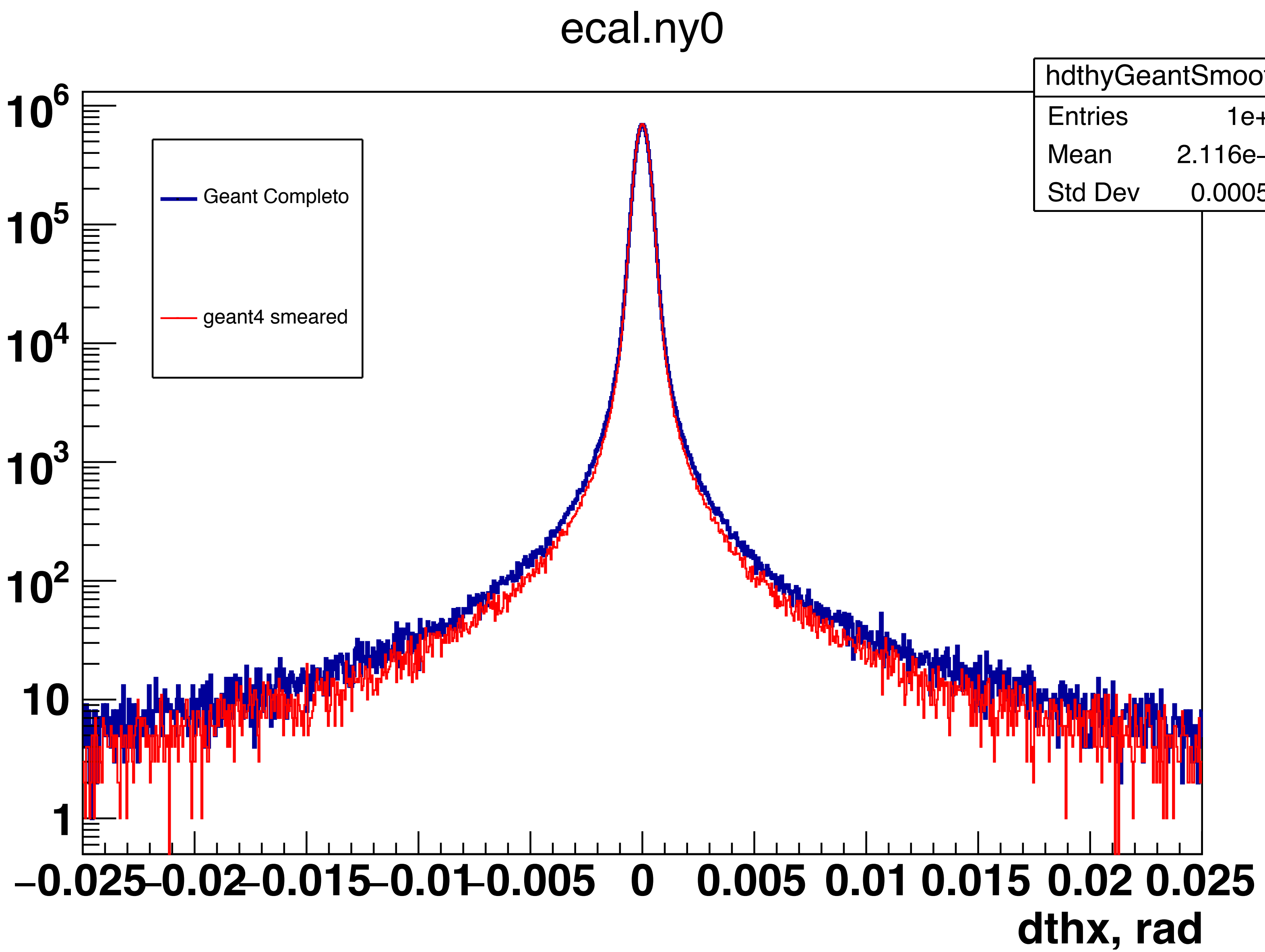


GEANT thy 5e8 evtns opt4



BACKUP

Geant Conv vs Full simulation



Geant Conv vs Full simulation